
MASSACHUSETTS STATEWIDE BICYCLE TRANSPORTATION PLAN



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Executive Summary and Action Plan

Introduction

The Massachusetts Highway Department (MassHighway) initiated the preparation of the comprehensive Statewide Bicycle Transportation Plan. The purpose of the plan is to develop policies and practices to improve conditions for bicycling in the Commonwealth. The Statewide Bicycle Transportation Plan builds upon past efforts and sets a framework for future actions.

As this is the first Massachusetts Statewide Bicycle Transportation Plan, MassHighway invited a number of state agencies, representatives of the bicycle community, and the public to help identify bicycle transportation opportunities and needs in several broad areas:

- highway planning, design, construction, and maintenance practices
- transit and multimodal connections
- safety education and enforcement
- tourism and promotion
- land use, zoning, and environmental reviews

The plan discusses successful local and state programs in each of these areas. The plan

identifies opportunities and needs to advance the statewide bicycle program and recommended actions to address them. The plan also contains an *Action Plan* which highlights specific actions to be taken by various responsible parties. While the plan recognizes the important implementation roles of the regional planning agencies (RPAs), municipalities, and others, the *Action Plan* outlines specific steps to be undertaken by agencies of the Commonwealth of Massachusetts. The Massachusetts Secretary of Transportation will direct and oversee implementation of the *Action Plan's* State highway, transit and multimodal elements.

Public Involvement

MassHighway held seven public information meetings throughout the Commonwealth in June, 1996. An electronic mailbox was created to receive public input for the plan, and postage-paid comment cards were included on the flyers distributed at the public meetings. MassHighway distributed comments received from these sources and notes of the public meetings to members of the project's Technical Advisory Committee

and User/ Focus Group, which provided additional review and comment.

MassHighway held a second round of seven public meetings in November, 1996, to discuss preliminary findings and draft recommendations. Draft recommendations were made available for public review prior to these meetings at the RPAs and on the Internet at www.vhb.com.¹ Comments were received via regular mail and e-mail for a 30-day period. During the first 10 months of 1997, the MassHighway planning, engineering, and district staff reviewed the plan extensively. MassHighway distributed a final Public Review Draft Plan to the 13 RPAs and to the State Transportation Library for a 30-day public review and comment period in the fall of 1997. MassHighway again posted the recommendation section of the plan on the Internet for review, and notices were sent to all persons on the plan mailing list, including persons who attended any of the 14 public meetings held in 1996.

Many commenters in the fall of 1997 called for a strengthening of the plan through the development of an implementation strategy and specific action items, each tied to a lead agency with a deadline for implementation. In response to these suggestions, MassHighway developed an *Action Plan*. The *Action Plan* draws from a list of over 70 plan recommended actions to create a focused bicycle program to be implemented by the turn of the century. MassHighway encourages the continued involvement of User/Focus Group during the next two years to monitor and update the plan.

¹ Vanasse Hangen Brustlin, Inc. (VHB) headed a consultant team who assisted MassHighway in the preparation of the plan.

Policy Framework

The vision of the Statewide Bicycle Transportation Plan is the recognition of bicycling as a viable means of transportation and reasonable accommodation of the needs of bicyclists in all policies, programs, and projects. Such actions will enhance the economy, environment, and quality of life in the Commonwealth, and improve personal mobility.

It is federal transportation policy "to promote increased use of bicycling, to accommodate bicycle and pedestrian needs in designing transportation facilities for urban and suburban areas, and to increase pedestrian safety."²

In recent years the Governor, the General Court, and Commonwealth agencies have taken action to recognize more formally the importance of bicycling within Massachusetts.

The Executive Office of Transportation and Construction (EOTC) prepared *Accessing the Future: The Intermodal Transportation Plan for the Commonwealth of Massachusetts*³ to guide transportation decisions into the next century. This plan recognizes bicycling as an element of the larger intermodal transportation system.

Specific bicycling objectives included in *Accessing the Future* are:

² T.D. Larson, Administrator, Federal Highway Administration, Memorandum to Regional Federal Highway Administrators: Policy on Bicycle and Pedestrian Projects, May 7, 1991.

³ EOTC, 1995.

- Improving awareness of bicyclists' needs in transportation facility design, construction and reconstruction.
- Making bicycle facilities an integral part of the highway system by designing and constructing roadways to safely and reasonably accommodate bicyclists.
- Implementing a spot-safety program to provide low-cost, small-scale improvements such as drainage grate replacement.
- Providing bicyclist access to and within park-and-ride facilities, and passenger rail, bus, ferry and air terminals; providing secure bicycle parking at these locations; providing safe and convenient bicycle conveyance aboard other modes.
- Developing training programs to promote safer bicycling

On May 20, 1996, Governor William F. Weld signed "An Act Relative to Bicycle and Pedestrian Access in Construction of Public Ways," which reads:

- The commissioner [of MassHighway] will make all reasonable provisions for the accommodation of bicycle and pedestrian traffic in the planning, design, and construction, reconstruction or maintenance of any project undertaken by the department. Such provisions that are unreasonable will include, but not be limited to, those which the commissioner, after appropriate review by the bicycle program coordinator, determine would be contrary to acceptable standards of public safety, degrade environmental quality or conflict with existing rights of way.

Commonly referred to as the *Bicycle and Pedestrian Access Law*, the legislation was enacted during the course of the preparation of this plan. An engineering directive issued in July 1997 in response to this law established a MassHighway benchmark for reasonable bicycle accommodation on roadways where bicycles are legally permitted.⁴ The benchmark calls for a desirable width of the outside travel lane plus paved usable shoulder of 5.0 meters (16.4 feet). The directive requires documentation of non-conforming designs and criteria to consider when determining reasonable accommodation, including compatibility with the surrounding area and impacts on trees, parkland, and historic areas. The 1997 *Highway Design Manual* also provides design guidance for bicycle accommodation on low-speed, low-volume roadways.

MassHighway is developing guidance in the application of the *Bicycle and Pedestrian Access Law* to other aspects of bicycle facility design as well as to planning, construction, reconstruction, and maintenance projects. The *Action Plan* discusses additional measures to implement the *Bicycle and Pedestrian Access Law*, presented later in the Executive Summary.

Jurisdictional Roles and Responsibilities

Cities and Towns

Roadways in Massachusetts are largely in municipal jurisdiction (77 percent of total

⁴ Thomas F. Broderick, Chief Engineer, "MassHighway Engineering Directive E-97-004, In Response to MGL CH 87 Acts of 1996, Bicycle and Pedestrian Accommodation," July 1, 1997.

roadway length) and private ownership (11 percent). MassHighway and other agencies can help to improve bicycling in Massachusetts through their planning, funding, and technical assistance roles, as well as on state-owned portions of the transportation system. However, it is in the interest of Massachusetts cities and towns, and the private sector, to play a strong role in addressing the bicycling needs of their communities.

Cities and towns initiate most projects that serve bicyclists. The state funds municipal roadway and other capital projects through Chapter 90, which distributes funds from the State Transportation Bond. The state also provides maintenance, snow removal, and policing funds through Chapter 81. Cities and towns can use this money to build bicycle facilities on and off roads, upgrade existing paths, and maintain facilities. Although it is up to the municipality to prioritize the use of this funding, MassHighway encourages that Chapter 90 funded projects conform to MassHighway Engineering Directive E-97-004.

Municipal public works and traffic departments construct and maintain most roadways. They upgrade roadways and operate traffic signals. Subdivision streets are sometimes accepted by the municipality as public ways and publicly maintained.

Municipalities may also gain access to federal funds, Greenways and Trails Grants, Urban/Self Help funds, Downtown Partnership Program funds, Community Development Block Grant (CDBG), and other funding programs to build and improve local sidewalks, bikeways, and streetscapes. In most cases municipalities pay for projects through a combination of funding sources.

Cities and towns may qualify for other types of funding from the state, such as Transportation Enhancement funds through MassHighway, and Community Development Block Grants (administered by the federal Department of Housing and Urban Development). The Executive Office of Environmental Affairs (EOEA) Division of Conservation Services administers Self Help and Urban Self Help programs to acquire and improve open space, including trails.

Cities and towns play the principal role in shaping land use and development patterns through zoning and subdivision regulations. Density controls, building setback requirements, parking requirements, site plan review requirements, and provisions for mixing or segregating land uses all affect bicycling conditions.

Regional Organizations

The 13 Massachusetts Regional Planning Agencies (RPAs) represent the cities and towns in their regions and develop regional transportation plans. A Metropolitan Planning Organization (MPO) differs from an RPA in that it includes representation from a number of transportation agencies and has specific responsibilities under the federal transportation funding system.

RPAs and MPOs play a primary role in prioritizing projects and coordinating state and federal funds for municipal projects. Through the Transportation Improvement Program (the TIP process), MPOs develop a list of projects for funding for a six-year horizon. This process includes all highway and transit projects, many of which include a bicycling component, as well as other fed-

erally funded projects. Each region works closely with MassHighway to direct funding to projects. MassHighway compiles all regional TIPs and publishes a statewide TIP (the STIP).

State Agencies

MassHighway has jurisdiction over 4,670 km (2,902 miles) or approximately nine percent of the total length of roadways in the Commonwealth. MassHighway is responsible for the design, construction, and maintenance of these state-owned roads. MassHighway will often build bicycle facilities along segments of state highways if the municipality agrees to assume responsibility for maintenance.

The State Department of Environmental Management (DEM) and the Metropolitan District Commission (MDC) also build and maintain extensive roadway and path systems on property that they manage. In addition, DEM also provides small grants through the Greenways and Trails Demonstration Grants Program to local non-profit organizations, municipalities, and RPAs.

A number of groups, organizations, government agencies, and others have addressed bicycle safety education and enforcement efforts in the Commonwealth. One of the key players over the past several years has been the Massachusetts Bicycle Safety Alliance. The Alliance was formed in 1993 in response to a statewide helmet use law for bicyclists under the age of 13 that went into effect in March, 1994. Since then the Alliance has continued to serve as a focal point for bicycle helmet promotion and safety activities in Massachusetts.

The Alliance consists of a core group of over 40 individuals representing a broad mix of interests and backgrounds. Members meet on a monthly basis to collaborate on a variety of helmet and bicycle safety initiatives and to share information and resources. The Alliance functions both as individuals and as a group; individual members pursue their own interests and professional responsibilities, but draw assistance and support from one another. The Alliance receives no funding for its programmatic efforts. It is currently chaired by Injury Prevention and Control Program staff in the Massachusetts Department of Public Health (MDPH), and receives operational support from that agency.

The Injury Prevention and Control Program has itself been a key player in Massachusetts' bicycle safety efforts. In addition to providing overall coordination to bicycle safety efforts in the Commonwealth, the program has led in the development and evaluation of new programs and activities. Through its networking with the medical community, local health departments and prevention centers, SAFE KIDS, schools, and the law enforcement community, it is able to extend its influence and further the goals of bicycle safety.

Another key player is the Governor's Highway Safety Bureau (GHSB), the focal point for all of the state's highway safety related activities. Alongside the MDPH Injury Prevention and Control Program, GHSB has played a leading role in producing safety materials and educating the public about the bicycle helmet law and the importance of wearing a helmet. It has also provided funding through its minigrant program to

support local efforts such as mass helmet purchases and bicycle safety rodeos.

At the state level, the EOE's Massachusetts Environmental Policy Act (MEPA) Unit reviews development projects for environmental impacts. MEPA requires that the proponents of projects that meet certain thresholds (square footage, traffic generation, parking spaces, and other criteria) must analyze the potential impacts of their projects. Bicycle access is a component of all transportation considerations, and there are opportunities for more specific treatments of bicycle access to and within new development.

Implementation Strategy

The Statewide Bicycle Transportation Plan is part of the evolving process to plan for better bicycling conditions locally, regionally and statewide in Massachusetts. Implementation will build upon efforts to date in improving bicycling conditions and will require a concerted effort of state, regional, and local agencies, private organizations and businesses, and the public.

As the agency preparing the plan, MassHighway, working with the User/Focus Group, the Technical Advisory Committee, other agencies and organizations, and the public, has provided specific recommended actions for improving bicycling conditions which reach beyond the scope of its own jurisdiction. A commitment of other state agencies, as well as regional and local agencies, will be necessary to carry out the recommended actions of the plan.

Two existing advisory boards and the User/Focus Group formed during the preparation of this plan will play an important role in identifying implementation strategies.

MassHighway recognizes the Massachusetts Bicycle Safety Alliance for its effective role to date in improving bicycle safety in the Commonwealth. The Alliance would continue to provide leadership, direction, and continuity to the bicycle safety program.

The second group that will assist in the development of implementation strategies is the Massachusetts Bicycle Advisory Board. The board, which has a legislative charge to "advise the departments on matters relative to bicycle transportation," consists of representatives of MassHighway, Department of Public Safety, DEM, MDC, RMV, MAPC, and five members appointed by the Governor.

Beyond the advisory responsibilities of the Massachusetts Bicycle Safety Alliance and the Massachusetts Bicycle Advisory Board, **there is a need to coordinate directly the bicycle-related activities of state agencies.** The Governor may also designate the Secretary of Transportation as the lead agency representative with responsibility for coordinating bicycle-related activities and programs of state transportation agencies. The Secretary may choose to form an implementation committee of the state agencies involved that would develop a phased work plan and funding requirements. The Secretary of Transportation, with input from the implementation committee and advisory boards, may seek funding for transportation related elements of the bicycle program. MassHighway also encourages that other key agencies seek funding to realize the objectives of this plan.

Transportation related bicycle program activities at the state level will be consolidated under EOTC. The Bicycle Program will submit a semiannual report to the Secretary of Transportation outlining progress implementing the *Action Plan*.

The Bicycle User/Focus Group formed to assist the Commonwealth in the preparation of this plan will monitor implementation of the *Action Plan* and assist the Bicycle Program in updates of the Statewide Bicycle Transportation Plan.

Action Plan

The following *Action Plan* draws from the extensive series of recommended actions that are discussed at length in the full plan. While many groups, organizations, and agencies shape bicycling conditions in Massachusetts, it is also evident that Commonwealth agencies play a key role. For this reason, EOTC and MassHighway developed the Recommended Actions to outline specific actions to be taken by Commonwealth agencies to advance the bicycle plan's agenda.

Establish Bicycle Program in EOTC

The Secretary of Transportation will create a Bicycle Program Office under the Executive Office of Transportation & Construction (EOTC) by July 1, 1998. The office will be staffed by a Bicycle Program Manager, who will report to the Secretary of Transportation. The responsibilities of the Bicycle Program Office will include, but not be limited to:

- monitoring and updating the Statewide Bicycle Transportation Plan and revising *Building Better Bicycling*;
- integrating bicycle considerations into the planning, design construction, operation, and maintenance of:
 1. all MassHighway-owned roadways and bridges where bicycling is legally permitted. The Program Manager will also work with the Metropolitan District Commission (MDC) and the Department of Environmental Management (DEM) on their roadways and bridges
 2. transit facilities operated by the Massachusetts Bay Transportation Authority (MBTA)
 3. bikeways owned by MassHighway. The Program Manager will also work with EOEA, DEM, the MDC and other state agencies on their bicycle facilities;
- assisting metropolitan planning organizations, regional planning agencies and municipalities in planning and implementing bicycle programs and facilities;
- assisting in the establishment of criteria for evaluating applications to expend federal Transportation Enhancement and Demand Management funds and state funds authorized for bicycle facilities.

Reconstitute Bicycle Advisory Board

The Secretary of Transportation will endorse appropriate legislation that creates a new Bicycle Advisory Board (BAB), replacing the existing board, to advise the Bicycle Program Office. The board will consist of the Secretary of Transportation or his/her des-

ignee, the Secretary of the Office Environmental Affairs or his/her designee, the Commissioner of Highways or his/her designee, the Commissioner of Environmental Management or his/her designee, the Commissioner of the MDC or his/her designee, the General Manager of the MBTA or his/her designee, the Superintendent of the State Police or his/her designee, the Commissioner of Public Health or his/her designee, the Director of Travel & Tourism or his/her designee, one representative of any regional planning agency and seven non-governmental members appointed by the Governor upon recommendation of the co-chairmen, three of whom will be experienced in bicycle safety, one of whom will be a representative of the commercial bicycle industry, and three of whom will be representatives of bicycle organizations. The Bicycle Program Manager will serve ex officio. Each appointee will serve without compensation for a term of two years and may be reappointed to serve for no more than three consecutive terms. Two co-chairmen will be selected by a majority vote of the board members, but at least one of the chairmen will not be an employee of the Commonwealth. The advisory board will meet at least four times a year. Among the board's primary responsibilities will be monitoring the implementation of this plan and assisting the Bicycle Program Office in future plan updates

Funding for the Bicycle Program

The Secretary of Transportation will seek and obligate funds from state and local sources to carry out the Bicycle Program.

Highway Planning, Design, Construction and Maintenance Practices

Action Item 1

The Bicycle Program Office working with MassHighway, and in consultation with the User/Focus Group, will release a rewritten *MassHighway Engineering Directive E-97-004* and circulate copies to all MassHighway offices, the MDC, the DEM, RPAs, municipal planning and highway departments, and other interested parties who request a copy. The rewritten directive will refer to on-road accommodation of bicycles, including shared roadways with wide outside lanes, bicycle lanes, and shoulder bikeways.

Action Item 2

MassHighway will conduct a statewide inventory of all public roadways (except local roads) and bridges where bicycles are permitted regardless of ownership. For roadways not directly under MassHighway's ownership or supervision, MassHighway will coordinate the inventory with the MDC, the DEM, the RPAs, and municipalities. The inventory will include, when possible, roadway geometric data, pavement condition, speed limits, and traffic characteristics. Using the results of this inventory, MassHighway will identify those segments of roadways and bridges where on-road bicycling does not meet criteria established in Engineering Directives. MassHighway will assess the feasibility of improving bicycle accommodation on these roadway and bridge segments. Once these data are available, MassHighway will establish goals for increasing the length of roadways with wide

outside lanes, bicycle lanes or shoulder bikeways as appropriate. MassHighway will complete these inventory, identification and goal-setting activities and provide a report to the Secretary of Transportation no later than July 1, 2000.

Action Item 3

The Bicycle Program Office, in conjunction with the BAB, will update and amend the Statewide Bicycle Transportation Plan as necessary, and evaluate the programs initiated by this *Action Plan*.

Action Item 4

The Bicycle Program Office will monitor all roadway, bridge and intersection improvement projects with respect to their conformance with Engineering Directive E-97-004. The Bicycle Program Office will furnish the Secretary of Transportation with a report every 12 months summarizing all projects reviewed for conformance with this directive, including documentation where reasonable bicycle accommodation was not provided. The first of these reports will evaluate projects reviewed from July 1, 1998, to January 1, 1999, and will be furnished to the Secretary of Transportation no later than March 1, 1999.

Action Item 5

MassHighway will establish a task force to assist in revising *Building Better Bicycling* to address all aspects of bicycle facility design, incorporating portions of the forthcoming

revised AASHTO *Guide for the Development of Bicycle Facilities* and portions of any other appropriate design guidance including model design manuals of other states. The task force will be comprised of the Bicycle Program Manager and at least one bicycle transportation expert who is not an employee of the Commonwealth in addition to other personnel appointed by the Commissioner of MassHighway. MassHighway will provide a revised and comprehensive *Building Better Bicycling* no later than September 1, 1999. Copies of the revised manual will be made available to the MDC, the DEM, the RPAs and MPOs, and municipalities to provide guidance in many comprehensive aspects of improving bicycling.

Action Item 6

MassHighway will develop and adopt standards and specifications for the detection of bicycles by actuated traffic signal systems in accordance with the *Manual on Uniform Traffic Control Devices*. These standards will be incorporated into the design process by December 1, 1998. Bicycle detection will be specified in new and retrofit projects involving actuated signal systems where needed. All projects funded or permitted by MassHighway will be subject to these standards and specifications.

Action Item 7

MassHighway will develop a spot-safety program to provide in a timely manner small-scale, inexpensive improvements to roadways it maintains. The improvements include such activities as modifying drain-

age grates, sweeping and repairing pavement. As part of Project Clean, the Bicycle Program Office will work with the bicycle community to develop a system for reporting to MassHighway bicycle-related conditions on roadways it owns. The spot-safety program will be operational by July 1, 1998. MassHighway will provide yearly reports on the progress of the program to the Secretary of Transportation.

Transit and Multimodal Connections

Action Item 8

The MBTA will conduct an inventory of bicycle parking facilities at all of its train and bus stations and assess the demand for additional facilities. The MBTA will develop a public-private partnership initiative to address additional facilities. This program will take into account the priority list of transit center bicycle parking needs identified by the Metropolitan Area Planning Council in their regional bicycle and pedestrian plan. The report on the public-private partnership initiative, including cost, will be provided to the Secretary of Transportation no later than December 1, 1999.

Action Item 9

The Secretary of Transportation will encourage other regional transit authorities (RTAs) to conduct similar bicycle parking facility inventories and assessments. MassHighway will encourage the RTAs to develop a capital improvement program, including funding requirements, to address the need for addi-

tional facilities and the expansion or modification of existing ones no later than December 1, 1999.

Action Item 10

The MBTA will investigate a plan to expand the "Bikes-on-the-T" program, as well as a plan to accommodate bicycles on rush-hour commuter trains and buses under its ownership, taking into consideration the operational difficulties of accommodating bicycles during rush hour, and submit it to the Secretary of Transportation by December 1, 1999.

Action Item 11

MassHighway will prepare similar inventories and assessment of needs for bicycle parking at park-and-ride lots and other intermodal transportation facilities under its ownership. MassHighway will submit a report and estimate of capital needs for these facilities to the Secretary of Transportation by September 1, 1999.

Safety Education and Enforcement

Action Item 12

The Secretary of Transportation, through the Bicycle Program Office, will work with other agencies in coordinating bicycle education and community outreach activities. These agencies include MassHighway, the Governor's Highway Safety Bureau, the Department of Public Health, the MDC, the DEM,

the RMV, and other Commonwealth agencies. The Bicycle Program will also advise regional planning agencies and municipalities in the planning and development of bicycle programs. These activities will begin no later than December 1, 1998.

Action Item 13

The Bicycle Program Office will develop a "Share the Road" campaign, designed to inform motorists and bicyclists of their rights and responsibilities and proper procedures for operating their vehicles on Massachusetts roadways. The Office will encourage the active cooperation of the RMV in successfully carrying out the campaign. This campaign will begin no later than May 1, 2000.

Action Item 14

The Bicycle Program Office will work with other appropriate Commonwealth agencies and bicycle groups in coordinating an annual Bicycle Education and Safety Conference to facilitate networking and sharing of ideas and programs. The first such conference will be held no later than December 1, 1999.

Tourism and Promotion

Action Item 15

The Bicycle Program Office, with the assistance of MOTT, will develop a multi-page publication oriented to the needs of the bicycle tourist. The publication will be completed by July 1, 1999.

Introduction

1

What is the Statewide Bicycle Transportation Plan?

The Massachusetts Highway Department (MassHighway) initiated the preparation of the comprehensive Statewide Bicycle Transportation Plan. The purpose of the plan is to develop policies and practices to improve conditions for bicycling in the Commonwealth.

How does the plan relate to other studies and efforts?

The Statewide Bicycle Transportation Plan builds upon past efforts and sets a framework for future actions. This plan draws upon *Accessing the Future: The Intermodal Transportation Plan for the Commonwealth of Massachusetts*. Bicycle-related goals from *Accessing the Future* include:

- Plan, promote, and provide safe travel for bicyclists and pedestrians, in a manner appropriate for each group, recognizing that bicycling and walking have distinct operational characteristics and safety requirements.

- Provide bicycle and pedestrian facilities and encourage bicycle and pedestrian travel as viable transportation modes.
- Reduce demands placed on highway facilities by encouraging the use of Transportation Demand Management and increasing the use of modes such as bicycles.

The Statewide Bicycle Transportation Plan also draws upon the Commonwealth of Massachusetts *Bicycle Facilities Inventory*, which was prepared for MassHighway in 1995 and *Building Better Bicycling: A Manual for Improving Community Bicycling Conditions*, prepared for MassHighway in 1994.

The Statewide Bicycle Transportation Plan was closely coordinated with the state's 13 regional planning agencies (RPAs). The RPAs assisted in facilitating the public involvement process, providing information on their current long range plans and programs as they relate to bicycling, and reviewing plan drafts. The RPAs have provided improvements for bicycling throughout the Commonwealth. These projects are drawn from Transportation Improvement Programs (TIPs) developed and submitted to MassHighway by the RPAs. The RPAs are also responsible for developing the bicycling element of their Long Range Transportation Plans (LRTPs), and

in addressing bicycling issues as part of their Unified Planning Work Programs (UPWPs).

What is included in the Statewide Bicycle Transportation Plan?

The plan consists of four basic components:

- Vision, Goals, Objectives and Performance Measures
- Current and Future Demand
- Opportunities and Needs
- Recommendations for Project and Policy Implementation

A major focus of the plan was the development and testing of a methodology to evaluate bicycle accommodation on roadways. Roadway characteristics, such as traffic volume and speed, width of travel lanes and shoulder, and truck volume, were inventoried at sample locations throughout the state. These locations, which were selected for their geographic diversity, yielded a variety of roadway types for study. The methodology is intended to be used to gauge the effect of physical or other changes to roadways to improve bicycle accommodation. The methodology is available to the RPAs and municipalities to perform more detailed local analysis.

Recommended actions were developed in the following areas:

- planning, design, construction and maintenance practices
- education and training programs
- public awareness, incentive and marketing programs
- enforcement policies and practices
- tourism promotion
- zoning and land use changes

Public Participation

Seven public information meetings were held throughout the Commonwealth in June, 1996. The public meeting notice and information used at the initial series of meetings are shown in Appendix A. An electronic mailbox (BIKEPLAN@VHB.COM) was created to receive public input for the plan. Postage-paid comment cards were included on the flyers distributed at the public meetings. Comments received from each of these sources and notes of the public meetings were distributed to members of the consultant team, the Technical Advisory Committee, and the User/Focus Group, which provided additional review and comment.

MassHighway held a second round of seven public meetings in November, 1996, to discuss preliminary findings and draft recommendations. Draft recommendations were made available for public review prior to these meetings at the RPAs and on the Internet. Comments were received via regular mail and e-mail for a 30-day period. The Final Draft Plan was also made available for a 30-day public review and comment period in the fall of 1997.

Policies, Goals and Objectives

2

Most bicycling occurs at the local level. The bicycling environment, however, is shaped by policies and actions at the federal, state, regional and local levels of government, and by both the public and private sectors. This plan recognizes the importance of appropriate actions and positive partnerships in order to improve bicycling conditions in Massachusetts.

Vision Statement

The vision of the Statewide Bicycle Transportation Plan is recognition of bicycling as a viable means of transportation and reasonable accommodation of the needs of bicyclists in policies, programs, and projects. Greater recognition and accommodation of the needs of bicyclists will lead to a more balanced transportation system with greater modal choice and improvements in bicycle safety. Such actions will enhance the environment and quality of life in the Commonwealth, and improve personal mobility.

Bicycling is also a highly efficient means of transportation as well as a healthy, enjoyable activity for people of all ages. (The Surgeon General has found that a regular, preferably daily, regimen of at least 30-45 minutes of brisk

walking or bicycling can lead to improved health.)⁵ For all these reasons, bicycling should be encouraged and promoted so that more people will choose to bicycle. Improving facilities for bicycling will lead to greater use of bicycles and an increase in the attendant benefits to citizens, communities, and the Commonwealth.

Federal Policy

"It is the policy of the United States to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the nation to compete in the global economy, and will move people and goods in an energy efficient manner."⁶

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, which expired in 1997, articulated the important perspective that goods and people are transported by a transportation system, not just a collection of individual modes of transportation, each of them

5 U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, "Physical Activity and Health: A Report of the Surgeon General," 1996.

6 Intermodal Surface Transportation Efficiency Act of 1991.

with separate agencies looking after their planning, construction and maintenance.

This multimodal perspective explicitly addressed the importance of bicycling as a distinct transportation mode. ISTEA also recognized that improving and sustaining bicycling, either alone or in conjunction with other modes is a key factor in meeting environmental goals. Good bicycling conditions are important in creating and sustaining livable communities, which in turn contributes to their economic prosperity. The Massachusetts Bicycle Transportation Plan is a direct consequence of the attention that bicycling has received in ISTEA and state transportation policy.

It is also federal transportation policy "to promote increased use of bicycling, to accommodate bicycle and pedestrian needs in designing transportation facilities for urban and suburban areas, and to increase pedestrian safety."⁷ In keeping with that federal policy, the National Bicycling and Walking Study set a goal of doubling the percentage of trips made by bicycling and walking, and at the same time reducing by 10 percent the number of bicyclists and pedestrians killed and injured in traffic crashes.⁸

State Policy

In recent years the Governor, the General Court, and Commonwealth agencies have taken action to recognize more formally the importance of bicycling within Massachusetts.

7 T.D. Larson, Administrator, Federal Highway Administration, Memorandum to Regional Federal Highway Administrators: Policy on Bicycle and Pedestrian Projects, May 7, 1991.

8 Federal Highway Administration, "The National Bicycling and Walking Study: Transportation Choices for a Changing America," 1994.

State Legislation

On May 20, 1996, Governor William F. Weld signed the following law:⁹

An Act Relative to Bicycle and Pedestrian Access in Construction of Public Ways

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the Authority of the same, as follows:

Chapter 90E of the General Laws is hereby amended by inserting after section 2, as appearing in the 1994 Official Edition, the following section:

- **Section 2A.** The commissioner shall make all reasonable provisions for the accommodation of bicycle and pedestrian traffic in the planning, design, and construction, reconstruction or maintenance of any project undertaken by the department. Such provisions that are unreasonable shall include, but not be limited to, those which the commissioner, after appropriate review by the bicycle program coordinator, determine would be contrary to acceptable standards of public safety, degrade environmental quality or conflict with existing rights of way.

On December 30, 1994, Governor Weld signed the 1994 Transportation Bond Bill¹⁰. Provisions related to bicycle transportation contained in that legislation are:

- **Section 96.** The general manager of the Massachusetts Bay Transportation Authority, or a designee of the general manager, is hereby authorized and directed

9 Chapter 87, Acts of 1996

10 "An Act Providing for an Accelerated Transportation Development and Improvement Program for the Commonwealth."

to provide for the accommodation of bicycle patrons and pedestrians in the planning, design, reconstruction and construction of any project undertaken by the authority unless the general manager, or a designee of the general manager, determines that the inclusion of such accommodations in such project would be contrary to acceptable standards of public safety, would be incompatible with an assessment of the costs and benefits involved, would degrade environmental quality, or would conflict with existing rights of way.

- **Section 97.** The commissioner of the Metropolitan District Commission, or a designee of the commissioner, is hereby authorized and directed to provide for the accommodation of bicycle traffic in the planning, design, reconstruction and construction of any project undertaken by the Commission unless the commissioner, or a designee of the commissioner, after appropriate review, determines that the inclusion of bikeways in such project would be contrary to acceptable standards of public safety, would be incompatible with an assessment of the costs and benefits involved, would degrade environmental quality, or would conflict with existing rights of way.
- **Section 112.** The Massachusetts Bay Transportation Authority and each regional transit authority are hereby authorized to develop a plan for the transportation of bicycles on all rolling stock and heavy rail vehicles used by the authority.

Accessing the Future

EOTC prepared *Accessing the Future: The Intermodal Transportation Plan for the Commonwealth of Massachusetts*¹¹ to guide transportation decisions into the next century. This plan recognizes bicycling as an element of the larger intermodal

transportation system. In Chapter 2, "Policies, Goals and Objectives," a framework is provided for the development of future transportation programs, improvement programs, and planning studies. This Chapter in particular, and the Plan in general, recognize bicycling as a distinctive transportation mode.

Some of *Accessing the Future's* primary bicycling goals are to plan, promote, and provide safe travel for bicyclists, to provide bicycle facilities, and to encourage bicycle travel as a viable transportation mode.

Specific bicycling objectives include:

- Improving awareness of bicyclists' needs in transportation facility design, construction and reconstruction.
- Making bicycle facilities an integral part of the highway system by designing, constructing and reconstructing roadways to safely and reasonably accommodate bicyclists.
- Implementing a spot-safety program to provide low-cost, small-scale improvements such as drainage grate replacement.
- Providing bicyclist access to and within park-and-ride facilities, and passenger rail, bus, ferry and air terminals; providing secure bicycle parking at these locations; providing safe and convenient bicycle conveyance aboard other modes.
- Developing training programs to promote safer bicycling

Other bicycle-specific references are found throughout Chapter 2.

In summary, *Accessing the Future* provides a firm basis upon which to build better bicycling. Its policies, goals and objectives are being implemented by Commonwealth agencies, and progress is being made. While the bicycle has always been recognized as an important part of the Commonwealth's transportation system, the adoption of State legislation and agency policies in recent years has provided greater emphasis

¹¹ Executive Office of Transportation and Construction, 1995.

and direction to improve bicycle accommodation.

Performance Measures

Implementing agencies should adopt performance measures. Potential performance measures that can monitor implementation of the Statewide Bicycle Transportation Plan include:

- **shoulder kilometers (miles)** - the number of kilometers of roadways in the Commonwealth with paved shoulders greater than or equal to .75 meters (2.5 feet) or 1.25 meters (4.1 feet) wide. Data from the Commonwealth's Roadway Inventory File can be used to estimate existing shoulder kilometers as can RPA or local data. Over time, the measure will be used to keep track of improvements and additions to shoulder kilometers on roadways under state, local and other jurisdictions.
- **wide travel lane kilometers (miles)** - this applies more to urban areas of the state and measures the effective width of the outside travel lane taking into account parking where present.
- **path kilometers (miles)** - the number of kilometers of bicycle paths, 2.5 meters (8 feet) or more in width.
- **bicycle parking units and usage data** - measures the number of parking spaces provided and the usage at different locations, such as:
 - public transit stations/stops
 - government buildings
 - major employers
 - major shopping areas
 - major recreational facilities
- **number of municipalities with bicycle parking provisions in their zoning ordinances and land use regulations**

- **bicycle accidents** - number of bicycle-motor vehicle accidents, especially those involving serious personal injury
- **bicycle usage** - as measured by on- and off-road counts
- **bicycle sales** - total units sold
- **Transportation Management Association (TMA) bicycle programs and participation**
- **bicycle racks on buses and usage** (number of racks and usage figures)
- **bicycle conveyance on other transit** (counts of bicycles on commuter rail, ferries, etc.)

Regional Policy

The 13 regional planning agencies (RPAs) in Massachusetts are responsible for developing long range transportation plans for their regions. In each of their transportation plans, the RPAs have formulated goals and objectives including those aimed at improving bicycling conditions.

The bicycle-related goals and objectives from each of the Massachusetts RPAs' long range transportation plans are included in Appendix B.¹² The analysis of Opportunities and Needs in Chapter 4 draws upon the bicycle policies currently in place at the regions and at Commonwealth agencies. The RPAs play a significant role in the development and implementation of bicycle improvements in the Commonwealth. Recommendations provided in Chapter 5 for improving bicycling conditions in the Commonwealth recognize the central role the RPAs play in bicycle transportation.

¹² A complete listing of Massachusetts' 13 RPAs is also provided in Appendix B.

Local Policy

Local policy regarding bicycling can influence bicycle conditions and use. Some Commonwealth communities have adopted policies affecting engineering, enforcement, education, and encouragement practices which shape how bicycles are accommodated locally. In addition, some communities have established bicycle advisory boards or committees to address local bicycling issues and to advise elected officials and agency personnel.

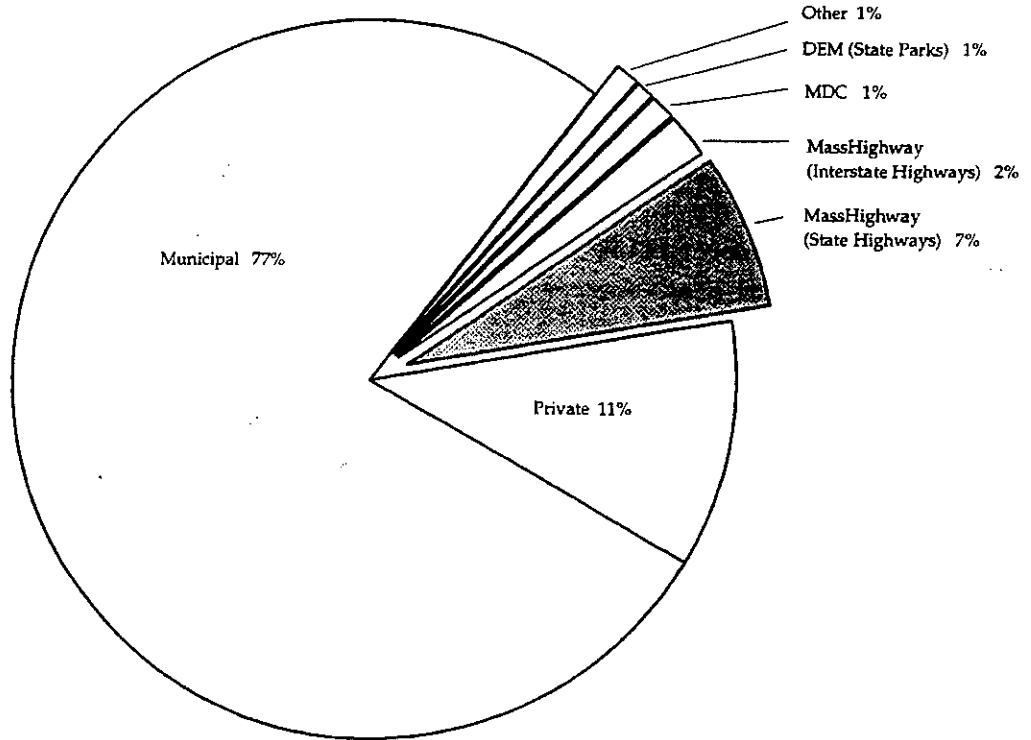
Roadways in Massachusetts are largely in municipal jurisdiction (77 percent of total roadway length) and private ownership (11 percent), as shown in Figure 1. MassHighway and other agencies can help to improve bicycling in Massachusetts through their planning, funding, and technical assistance roles, as well as in state-owned portions of the transportation system. However, it is in the interest of Massachusetts

cities and towns, and the private sector, to play a role in addressing the bicycling needs of their communities.

Relation to Statewide Pedestrian Transportation Plan

Walking is another important component of our balanced transportation system. MassHighway has prepared separate bicycle and pedestrian plans on similar time schedules. Separating the plans recognizes the differences in these modes and the importance of each. Separate plans allow each mode to receive the detailed attention to issues it requires. The two plans have been coordinated to ensure that they are consistent. It is important to recognize that there is no inherent conflict between pedestrians and bicyclists. The transportation system is well served by giving both these modes higher priority.

Figure 1 Roadway Ownership In Massachusetts



Source: Massachusetts Highway Department

Current and Future Bicycle Demand

3

Introduction

The three sections of this chapter assess components of bicycle demand. The first section provides data on national bicycling issues and trends. The second reviews why people bicycle and in turn what factors might encourage greater bicycle use. The third presents more specific data on bicycling participation, demand, and sales in Massachusetts. Specific data on bicycling throughout Massachusetts should be supplemented. There is a need to quantify demand and to collect data to measure the performance of programs. Bicycling in the U.S. is changing, as evidenced most dramatically by the recent peak in popularity of mountain-style bicycles. Most data predate this change.

Bicycling in the United States

Nationwide Personal Transportation Survey

A source of detailed information on bicycling and walking in the United States is the Nationwide Personal Transportation Survey (NPTS). The survey is conducted approximately every

seven years. The first three were home interview surveys; the most recent, conducted in 1990, was a telephone survey. The survey is conducted throughout the year and includes information on the travel of persons aged five and above.

The 1990 NPTS interviewed 48,385 persons living in 22,317 households.¹³ Each respondent was asked to provide information on all travel during a recent 24-hour period, including the purpose of the trip, distance traveled, and travel mode. Information was collected for each segment of multimodal trips, such as a walk to a bus stop or bicycle ride to a rail station.

Results revealed that only one out of five trips involves travel to or from work, and less than two percent involve on-the-job travel. The largest portion of trips (42%) is family or personal business travel. Social or recreational travel accounts for another quarter of trips. (This category includes visits to friends or relatives, trips to a park or sporting event, as well as "pleasure driving" and vacation trips.) Overall, 7.2 percent of all trips were by walking and 0.7 percent by bicycle. More than 11 percent of

13 "Nationwide Personal Transportation Survey, User's Guide to the Public Use Tapes," Research Triangle Institute. 1991

all trips in central cities were by walking or bicycling.¹⁴ An estimated 1.7 billion bicycling trips were made in 1990.¹⁵

According to the NPTS, more than half of the bicycle trips and a third of the walking trips in the United States were for social or recreational purposes. Family and personal business travel, along with school and church-related travel, were also significant contributors. Average length of a trip was 3.2 km (2.0 miles) for bicycling. Forty percent of all trips, regardless of mode, are two miles or less, indicating great potential for increased bicycle travel.

Who Bicycles?

In Case Study No. 1 of the 1994 *National Bicycling and Walking Study*,¹⁶ Stewart A. Goldsmith examines a variety of survey data to answer the question: Who bicycles? Estimates of adult bicyclists in the United States range from 48 to 70 million. At least two demographic variables appear to be correlated with bicycle use: sex and age. In nine of 10 surveys cited by Goldsmith, male bicyclists outnumber female bicyclists. In four of these surveys, male bicyclists comprise two-thirds or more of total bicyclists.

Goldsmith also references surveys from the 1970s to the 1990s which indicate that bicycling decreases with age. In all cases, at least two thirds of bicyclists were under the age of 45. For example, a 1991 Harris poll¹⁷ found that 39 percent of adult bicyclists were age 18 to 29 and another 26 percent were in their 30s (65 percent under 40 years of age). The same poll found that 91 percent of bicycle commuters were under the

age of 40. This generational group may perform differently than their predecessors as they age, as have the "boomers."

An extensive study of 1990 U.S. Census data conducted by Michael R. Baltes,¹⁸ indicates that levels of bicycle use vary greatly from metropolitan area to metropolitan area in the United States. Metropolitan areas with relatively high levels of nondiscretionary bicycling appear to have urban densities that promote shorter trips, relatively temperate year-round climates, and a large proportion of students, particularly college students. Commuting to work by bicycle is most prevalent in metropolitan areas that have unique communities within their boundaries, such as universities and colleges.

Information on who bicycles can assist in planning and design of new facilities, keeping in mind the FHWA classification of advanced, basic adult and child bicyclists (Groups A, B and C, respectively). This is discussed more thoroughly in Chapter 4.

Factors Influencing the Decision to Bicycle or Walk

Many factors influence choice of travel mode and, in particular, the decision to bicycle or walk. These factors operate at different levels in the decision process. One 1992 analysis identified a three-tiered hierarchy of factors categorized according to initial considerations, trip barriers, and destination barriers.¹⁹

14 "Personal Travel in the United States," Klinger and Kuzmyak, 1986.

15 Research Triangle Institute, 1991.

16 "Case Study No. 1: Reasons Why Bicycling and Walking Are and Are Not Being Used More Extensively as Travel Modes," *National Bicycling and Walking Study*, 1994.

17 *Pathways for People*, Rodale Press, Inc., 1992.

18 "Factors Influencing Nondiscretionary Work Trips by Bicycle Determined from 1990 U.S. Census Metropolitan Statistical Area Data," in *Transportation Research Record No. 1538*, 1996.

19 FHWA PD-93-041, the National Bicycling and Walking Study Case Study No. 1: Reasons Why Bicycling and Walking Are and Are Not Being Used More Extensively as Travel Modes, 1992

Initial Considerations

Distance, or its companion factor, time, is often cited as a reason for not bicycling or walking. According to 1990 NPTS results, the average length of a trip is 14.5 km (9.0 miles), regardless of mode. Trips to work are slightly longer, while shopping and other utilitarian trips are shorter. More importantly, 27 percent of trips are 1.6 km (1.0 mile) or less; 40 percent are 3.2 km (2.0 miles) or less; and 49 percent are 4.8 km (3.0 miles) or less. Trips within 4.8 km (3.0 miles) are reasonable bicycling distance.

Generational and individual attitudes and values are also important in the decision to bicycle or walk. People may choose not to bicycle or walk because they perceive these activities as socially inappropriate or as inappropriate for those who can afford a car. Others may have quite different values, viewing bicycling and walking as beneficial to the environment, healthful, economical, and free from the problems of contending with traffic or finding parking.

Individual perceptions also play a role in the decision process. Safety concerns, such as traveling at night, must be addressed. Although walking and bicycling can be accomplished at low levels of exertion, some people perceive that these activities are beyond their capabilities.

Finally, there are situational constraints that, while they may not totally preclude the decision to bicycle or walk, do require additional planning and effort. Examples include needing a car at work, having to transport items that are heavy or bulky, and needing to transport additional passengers.

Trip Barriers

One of the most frequently cited reasons for not bicycling or walking is the perception of safety

in traffic.²⁰ Given the prevailing traffic conditions found in many urban and suburban areas—narrow travel lanes, high motor vehicle speeds, congestion, lack of sidewalks, pollution, noise, etc.—many individuals who could meet some of their transportation needs by bicycling or walking do not, simply because there is, or they perceive, too great a risk to their safety and health.

Even communities with well designed bicycling and walking facilities can still be faced with difficulties of access and linkage. Facilities that do not connect neighborhoods to shopping areas or downtown businesses may not achieve their intended purpose of increased use of non-motorized travel modes. Directness of the route and personal safety and security considerations are also important factors in individual decisions to bicycle or walk.

Environmental factors can also be considered in this category of trip barriers. Examples include hilly terrain, extreme temperatures, strong winds, high humidity, and frequent or heavy rain or snowfall.

Destination Barriers

Facility and infrastructure needs do not stop with arrival at the work site or other destination. Many bicyclists are discouraged from becoming bicycle commuters because once at work they have no place to park their bicycle safely or shower and change.

Secure bicycle parking deserves special attention. The availability of parking is a prerequisite for automobile use; the same holds true for bicycling. Bicyclists also face possible theft or vandalism to their bicycles. Even when parked securely, bicycles are frequently exposed to damage from rain and other environmental con-

²⁰ National Bicycling and Walking Study, Case Study No. 4.

ditions. Secure bicycle parking is necessary before bicycle use will increase.

Destination barriers can also take a less tangible form, such as a lack of support from employers and co-workers. Such support can be particularly important for sustaining a long-term commitment to bicycling or walking transportation. In some cases this support may be direct, such as a discount on insurance costs or reimbursed parking expenses. In other cases it may be less direct but equally important, such as allowing a less formal dress code.

Public Support for Bicycling

Regardless of the commitment of federal, state, regional and local governments to bicycling transportation, and regardless of local bicycling conditions, the full potential of bicycling as a transportation mode will not be realized if the public is unwilling to recognize and use bicycles as a viable transportation option. If recent survey results are any indication, the public already strongly supports increased travel options. A 1991 Harris Poll performed for Rodale Press showed that 46 percent of adults aged 18 and older—82 million Americans—had ridden a bicycle in the previous year. Of these:

- 46% stated they would sometimes commute to work by bicycle if safe bicycle lanes were available.
- 53% would if they had safe, separate designated paths on which to ride;
- 45% would if their workplace had showers, lockers, and secure bicycle storage; and
- 47% would if their employer offered financial or other incentives.²¹

Current interest in providing more bicycle facilities is another clear indication of public sup-

port for bicycling. This interest is evident in Massachusetts as shown by support for specific bicycle projects and response to this plan.

Bicycling in Massachusetts

Bicycling Participation

Participation in bicycling throughout Massachusetts is robust, as evidenced by usage data collected on roadways in the Commonwealth. For example, bicycle counts at selected roadway intersections in the Boston area show up to 200 bicyclists per hour in 1995 on selected Boston area roadways (see Table 1). The number of bicyclists passing through Arlington Center tripled with the completion of the nearby 16.9 km (10.5-mile)-long Minuteman Commuter Bikeway in 1993. Counts taken in 1995 showed 187 bicyclists at this location during the afternoon peak hour compared to only 64 in 1990. A bicycle count conducted on Massachusetts Avenue in Cambridge in 1994 showed about 1,600 bicyclists passing through Central Square on a summer weekday.

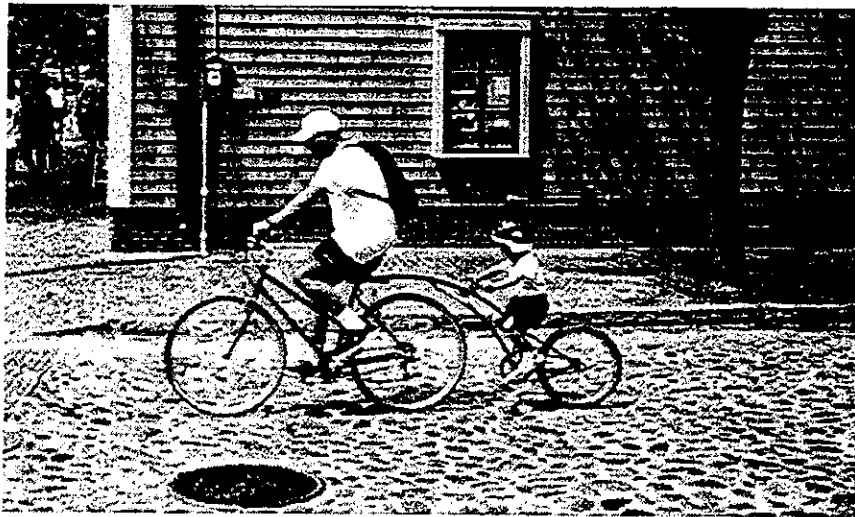
Utility bicycling, which includes commuting, has accounted for part of the overall increase in bicycling. More adults are finding it convenient to use a bicycle to make short trips to the bank or store, or to visit friends. Use of a bicycle for these and other trips may allow some households to forego the expense of a second automobile, especially in densely populated areas where shopping centers and workplaces are relatively close to home.

Much of the growth in bicycling in Massachusetts can be attributed to improved bicycling conditions (such as a greater number of bicycling facilities and more comfortable mountain bicycles) and increased interest in low-impact fitness. Increases in sales of accessories such as two-wheeled bicycle trailers for transporting

²¹ "Pathways for People, Rodale Press, Inc., 1992.



small children and "trailer bicycles," which have one wheel and attach to the seatpost of a bicycle,² illustrate the apparent increase in family bicycling. The results of this increased interest can be witnessed on any Commonwealth bicycle path on a nice day.



Over 100 years of bicycling history in Massachusetts: Nantucket ca. 1890 (top) and 1996 (bottom)

Table 1
On-road Bicycle Traffic Volumes at Selected Intersections in the Boston Area
(Weekday Evening Peak-Hour)

Location	9/24/80	10/1/85	9/26/90	9/28/93	9/24/94	9/27/95
Cambridge — Porter Square	135	181	196	176	187	196
Arlington — Mass. Ave. at Alewife Brook Pkwy.	68	72	64	61	76	78
— Arlington Center	79	80	64	110	130	187
Belmont — Concord Ave. at Blanchard Rd.	57	26	16	26	31	24
Lexington — Mass. Ave. at Marrett Rd.	49	40	38	18	38	30
Bedford — Hartwell Ave. at Maguire Rd.	14	5	11	9	2	0

Source: Minuteman-Charles River Connector Study, 1996, Central Transportation Planning Staff.

Table 2
Massachusetts Avenue at Pearl Street, Central Square, Cambridge: On-road Bicycle Volumes:
Hourly Volumes Summer Weekday (June 28 and 30, 1994)

Time of Day	Eastbound Bicyclists	Westbound Bicyclists	Total
7:00 a.m.-8:00 a.m.	44	26	70
8:00 a.m.-9:00 a.m.	65	38	103
9:00 a.m.-10:00 a.m.	65	55	120
10:00 a.m.-11:00 a.m.	64	40	104
11:00 a.m.-12:00 p.m.	47	47	94
12:00 p.m.-1:00 p.m.	64	56	120
1:00 p.m.-2:00 p.m.	52	48	100
2:00 p.m.-3:00 p.m.	53	73	126
3:00 p.m.-4:00 p.m.	66	71	137
5:00 p.m.-6:00 p.m.	71	156	227
6:00 p.m.-7:00 p.m.	91	158	249
Totals	<u>734</u>	<u>863</u>	<u>1,597</u>
Average Per Hour	61	72	133

Source: City of Cambridge.

(Note: The above counts were conducted during relatively good weather periods.)

Table 3
Multi-Use Data for the Norwottuck Rail Trail

Location	Bicycles	Pedestrians	In-Line Skaters	Total
Thursday, August 21, 1996, 7:00 AM to 7:00 PM				
Amherst	104	73	34	211
Northampton	158	65	20	243
Hadley	203	23	47	273
Saturday, August 23, 1996 7:00 AM to 5:00 PM				
Amherst	318	52	72	442
Northampton	424	172	81	677
Hadley	467	56	86	609

Source: Pioneer Valley Planning Commission.

The growth in family bicycling is also a result of construction of off-road bicycling facilities, such as the Minuteman, Norwottuck and Cape Cod Trails, which may be perceived by some bicyclists as safer than on-road facilities. The Minuteman seems to have attracted people to bicycling who were not involved in bicycling prior to the path's construction.²³ This may also be the case for bicycle paths in other areas of the Commonwealth.²⁴

Bicycle paths and rail trails have become extremely popular for many purposes. Data on usage of the 13.7 km (8.5 mile)-long Norwottuck Trail linking Amherst, Hadley and Northampton, collected on an overcast weekday and weekend day, demonstrates substantial use of the facility by bicyclists, pedestrians, and skaters (see Table 3). Counts taken on the Minuteman show nearly 300 bicyclists per hour on 5/24/94, a weekday (Minuteman-Charles River Connector Study, CTPS).

Bicycle Traffic to the Cape and the Islands

The growth of multimodal bicycling in Massachusetts is also reflected in the number of bicycles transported by ferries to Nantucket and Martha's Vineyard, and to Cape Cod. According to data from the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority, 45,364 passengers and 3,509 bicycles were transported to Nantucket aboard the Hyannis-Nantucket ferry during the month of July, 1995, as shown in Table 4. The number of bicycles in Table 4 does not include those carried on or in passenger vehicles, only those walked onto the ferry.

On Saturday, July 1, 1995, 2,646 passengers, 429 bicycles and 303 motor vehicles were transported on the Steamship Authority ferry to Nantucket.²⁵ Thus, 16 percent of ferry passengers brought their own bicycles and did not bring a motorized vehicle to the island. As described below, a large number of visitors to Nantucket rent bicycles on the island. These visitors arrive by ferry or by air. A substantial percentage of Nantucket visitors do not have access to passenger vehicles while on the island, and travel extensively by bicycle on the island. This influences the number of motorized vehicle trips on the island and the attendant congestion and air pollution.

The Martha's Vineyard-bound ferries, Woods Hole-Vineyard Haven and Woods Hole-Oak Bluffs, transported 9,667 passengers, 538 bicycles and 1,279 motor vehicles on July 1, 1995. During the entire month of July, the ferries transported a total of 172,445 passengers, 8,227 bicycles and 23,141 automobiles. The ferries carried smaller percentages of passengers with bicycles than the Nantucket ferry, but the data show that a large amount of ferry passengers use non-motorized transportation while on Martha's Vineyard.

²³ Interview with Alan McClennen, Director of Planning and Economic Development, Town of Arlington, June 11, 1996.

²⁴ Telephone interview with Jerry Coull, Owner of Valley Bicycles, Amherst, July 22, 1996.

²⁵ The Hyline Ferry and the Freedom Cruise Lines also transport bicycles to and from Nantucket.

Table 4
Traffic Figures, Nantucket and Martha's Vineyard-bound Ferries--July 1995

Ferry	July 1, 1995 (Saturday)		
	Passengers	Bicycles	Autos
To Nantucket			
Hyannis - Nantucket	2,646	429	303
To Martha's Vineyard			
Woods Hole - Vineyard Haven	6,939	299	1,027
Woods Hole - Oaks Bluff	2,728	239	206
Totals	12,313	967	1,572

Ferry	Total for July 1995		
	Passengers	Bicycles	Autos
To Nantucket			
Hyannis - Nantucket	45,364	3,509	6,029
To Martha's Vineyard			
Woods Hole - Vineyard Haven	113,710	4,842	16,827
Woods Hole - Oaks Bluff	59,735	3,385	6,314
Totals	217,809	11,736	29,170

Source: Woods Hole, Martha's Vineyard and Nantucket Steamship Authority

Rental information for Nantucket also shows a large number of tourists rent bicycles while visiting the island. For example, the largest bicycle shop on Nantucket rents approximately 400 bicycles on a typical summer day.²⁶ Almost all of the shop's bicycles are rented at any given time in July or August. Interviews with other rental shop owners indicate that approximately 900 bicycles are rented on a summer day on Nan-

tucket.²⁷ The numbers of bicycles rented on and transported to Nantucket represent not only a large number of visitors utilizing non-motorized transport, but also a measurable economic impact.

Bicycle Sales

Bicycle sales over the past five years have increased substantially in Massachusetts. Repre-

²⁶ Telephone interview with Greg Lockhart, Manager, Young's Bicycle Shop, July 22, 1996.

²⁷ Telephone interview with Shedd Sanguinetti, Manager, Cook's Cycle, Nantucket, July 22, 1996; Telephone interview with Jodie Corkish, Repairs Manager, Nantucket Bicycle Shop, July 22, 1996.

representatives of many bicycle shops in Massachusetts report sales increases greater than 10 percent annually during that period.²⁸ The "mountain bike" with wide tires and multiple speeds has been a major factor in the increase in bicycling participation and sales. Large numbers of new users have been attracted to bicycling by the versatility and image associated with the mountain bike. These bikes are used most often as a road bicycle that can easily hop curbs and maneuver in other situations. They are operated off-road much less frequently, perhaps as little as 10 percent of the time according to some estimates,²⁹ although the percentage is probably higher in areas with easily accessible off-road facilities, such as Western Massachusetts.

Nationally, trends in bicycling use show continued growth. According to the Bicycling Institute of America, bicycle usage is at an all-time high in the United States, with 100 million bicycle owners in 1994-1995³⁰. Adults age 16 and older comprise 55 percent of bicycle owners. Thirty-one million adults rode on a regular basis (at least once a week), with 4.9 million of those riders regularly using their bicycles for commuting, 1.7 million for touring, 80 percent or 25 million riding mountain bikes in 1994-95.³¹

Future Demand

The demand for bicycling in the Commonwealth has increased in recent years according to counts

of bicyclists on roadways and paths. Retailers also note substantial increases in bicycle sales over the last five years. Industry representatives have suggested that part of the increase in bicycling may be due to new bicycle paths which have attracted people to bicycling who were not previously active.

Forecasting the number of bicycle trips that will be made on a new bicycle facility is difficult at best. For example, the actual number of users on the Minuteman is over 10 times what was expected, according to Alan McClennen, Arlington's Director of Planning and Development.

While there is no general agreement on a methodology for forecasting bicycle use, one of the best sources currently available on the subject was published in 1994 as a supplement to the *National Bicycling and Walking Study*.³² According to this report, the continuity of the bicycling and walking compatible network and the destination serving capacity of the network influence the number of trips taken by bicyclists and walkers. The studies and data reviewed for the report suggest that considerable latent demand for bicycling and walking will be released if physical impediments to these modes are removed or reduced.

Research conducted by Michael R. Baltes and referenced earlier in this chapter showed that commuting by bicycle is more prevalent in metropolitan areas that have unique communities within their boundaries, such as universities and colleges. The study also showed that metropolitan statistical areas (MSAs) with higher levels of nondiscretionary bicycling seem to have urban densities that promote shorter trips and

28 Interviews with John Allis and Clint Page, Co-Owners, Belmont Wheelworks and Ace Wheelworks, Belmont and Somerville, June 10 and 17, 1996; Telephone interview with Mary Ellen Fletcher, Partner, International Bicycle Centers, Brighton and Newton, June 4, 1996; Telephone interview with Gerry Slack, President, Cycle Loft, Burlington, June 24, 1996; Telephone interview with David Conn, President of Bicycle Alley, Worcester, June 24, 1996.

29 Allis

30 Cited by NBDA in 1994-95 Statpack.

31 National Bicycle Dealers Association, 1994-95 Statpack. Obtained from the NBDA World Wide Web site.

32 University of North Carolina Highway Safety Research Center, "A Compendium of Available Bicycle and Pedestrian Trip Generation Data in the United States," October 1994.

relatively temperate year-round climates. However, Baltes admits that "the results [of his research] provide little guidance on what can be done to increase the level of bicycling for non-discretionary trips. Such guidance is more likely to be had from the results of a study of those unique MSAs in which there are high levels of bicycling."³³

The field of predicting bicycle demand is an evolving one. Research to date is limited but FHWA and others are currently conducting research on bicycle use modeling and forecasting.

When planning and designing bicycle facilities, the needs of varied types of bicyclists should also be considered. The FHWA classification of advanced, basic adult, and child bicyclists (referred to as Group A, B, and C, respectively) can be useful in educating the public and designers about the needs of bicyclists with different abilities or levels of proficiency. This topic is discussed further in the next chapter.

It is likely that recent trends showing growth in bicycling in Massachusetts will continue with more people bicycling and more trips being made by bicycle. In the next chapter, opportunities are identified for improving bicycling conditions in the Commonwealth.

³³ Baltes, in *Transportation Research Record 1538*, page 101.

Opportunities and Needs

4

Introduction

The purpose of this chapter is to identify opportunities for improving bicycling conditions in the Commonwealth. The chapter is divided into the following sections:

- Assessing Bicycle Accommodation on Roadways
- Bicycle Path Development
- Design, Construction and Maintenance Practices
- Transit and Multimodal Connections
- Bicyclist Safety Education and Enforcement
- Tourism and Economic Development
- Land Use and Zoning

Each section identifies opportunities and needs. Recommendations for addressing each of these opportunities and needs are presented in the next chapter.

Assessing Bicycle Accommodation on Roadways

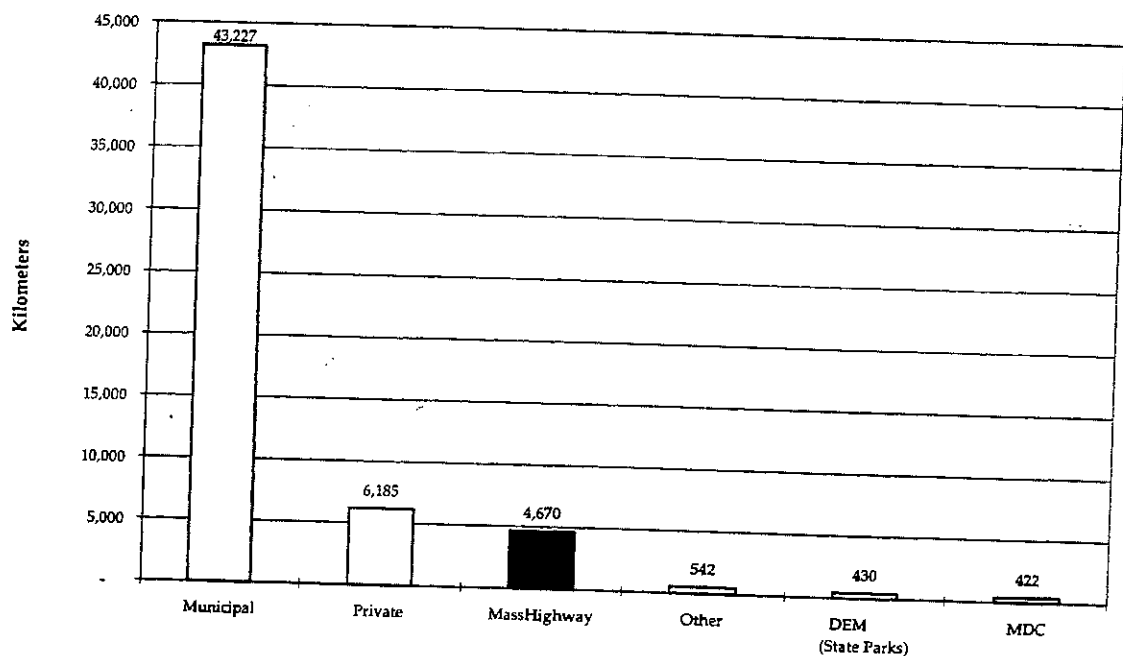
Context

The bicycle circulation system consists of existing roadways and off-road paths. While roads and paths are both important for bicycle travel, roads are the key element because the road network is more extensive and provides access to most destinations.

Defined as vehicles by state law, bicycles are allowed access to all roadways in the Commonwealth other than limited access highways where their use is specifically prohibited by signs. While most roadways are available for bicycle travel, conditions that affect bicycle travel vary from roadway to roadway.

Most roadways in Massachusetts are locally owned. As shown in Figure 2, MassHighway has jurisdiction over only 4,670 km (2,902 miles) or approximately 9% of the total length of roadways in the Commonwealth.

Figure 2 Centerline Kilometers of Roadways by Jurisdiction



Limited research indicates that bicyclists are more comfortable riding on a roadway that has sufficient lateral space to minimize interaction with motor vehicles, and lower motor vehicle speed. Interaction and potential conflict with motor vehicles is less when traffic volumes are lower. The same is true for trucks and other heavy vehicles, such as buses, which take up more lateral space and may crowd a bicyclist on a roadway more than a standard passenger vehicle. Other factors including pavement condition, the number of curb cuts for driveways, intersections, and parking turnover may also affect bicycle travel on a roadway.

Chapter 87, Acts of 1996, (legislation described in Chapter 2) directs the Commissioner of MassHighway to "make all reasonable provisions for the accommodation of bicycle and pedestrian traffic in the planning, design, and construction, reconstruction or maintenance of any project undertaken by the department." Therefore, when any appropriate roadway is being

constructed or reconstructed by MassHighway, reasonable bicycle accommodation will be addressed.

In 1997, MassHighway's Chief Engineer issued *Engineering Directive E-97-004* which states:

Project design engineers shall use sound engineering practice in making reasonable provisions to accommodate bicycles and pedestrians in project designs. This generally includes assuring continuous paths of travel with smooth surfaces and without obstructions or impediments.

The Massachusetts Highway Department benchmark for reasonable bicycle accommodation is to provide a continuous paved usable shoulder adjacent to the outside travel lane in each direction on roadways where bicycles are legally permitted. The desirable width of the outside travel lane plus the paved usable shoulder (curb lane) is at least 5.0 meters (plus 0.5 meter "guardrail" offset). When this width cannot be reasonably accommodated, the minimum width of the outside travel lane plus the

paved usable shoulder (curb lane) for the accommodation of bicycles is 4.5 meters (plus 0.5 meter offset). For roadways with speeds of less than 45 mph (85th percentile speeds) combined with volumes of less than 2000 AADT, the minimum roadway widths as defined in Chapter 8 of the Highway Design Manual may be used to conform with bicycle accommodation. This directive does not preclude the use of additional AASHTO design guidance for bicycle accommodation.

It is also important to identify and select new projects to better accommodate bicycles on the existing road network. This effort is essential for improving bicycle circulation conditions on roadways in the Commonwealth. Efforts to improve bicycle accommodation should not be restricted to road projects developed for other reasons. In addition, new projects should be identified to improve conditions on roads that are important for bicycle travel.

This latter effort can readily be incorporated in ongoing planning efforts of the public agencies and authorities responsible for the Commonwealth's roadway system. MassHighway and the 13 regional planning agencies (RPAs) play key roles in this process. MassHighway and the RPAs maintain databases on roadway characteristics and use traffic models and management systems to identify existing and future characteristics of the roadway network. A methodology to evaluate some of the primary factors affecting bicycle travel on roadways has been developed as part of this plan. The methodology, which is described later in this section, can be incorporated in current transportation planning activities to give an initial indication of where roadway improvements to better accommodate bicycle travel are most applicable.

Identifying Desirable Corridors

Bicyclists, like motorists, tend to seek linear, continuous corridors that offer numerous connections. Connections are one of the most important elements of any transportation system. Desirable bicycling corridors should connect a variety of land uses to fully realize their potential. Land use data can be useful in determining desirable corridors for bicycle travel by identifying land uses that are typical origin and/or destination locations for bicyclists. Populated areas, such as urban areas, residential areas and village centers, should be identified because these areas typically generate the majority of bicycle trips. Populated areas should be connected to multimodal transportation centers, commercial areas, business districts, institutional facilities, existing bicycle facilities and recreational areas. Connecting these types of land uses with on- and off-road bicycle facilities promotes and encourages bicycling as a means of transportation. Identifying land uses along roadway corridors coupled with good corridor accommodation ratings indicates a potentially desirable bicycling corridor.

Identifying Potential Improvements

A roadway that has bicycle-appropriate land uses within the corridor should be considered an area of potential bicycle travel; however, traffic flow and/or cross sectional characteristics may not necessarily be desirable for bicycle travel. As development increases along roadway corridors the roadway infrastructure is often upgraded to accommodate increased traffic volumes. As the development cycle continues the roadway cross section may not be widened to accommodate all potential users, such as bicyclists and pedestrians. A systematic evaluation of an area's roadway system is needed to help

identify measures that could be taken to better accommodate bicycle travel.

Methodology

Recent and ongoing research suggests factors to consider when evaluating how a roadway facility accommodates different types of bicyclists. One source of this information is "Selecting Roadway Design Treatments to Accommodate Bicycles," published by FHWA in 1994 and included as an appendix in "Building Better Bicycling." In this publication, FHWA recognizes that there is no single design bicyclist, suggesting instead that the needs of bicyclists of different abilities be recognized in the planning and design of bicycle facilities. FHWA classifies bicyclists in three broad groups:

Group A—Advanced Bicyclists

These are experienced riders who can operate under most traffic conditions. They comprise the majority of the current users of collector and arterial streets and are best served by the following:

Direct access to destinations, usually via the existing street and highway system.

The opportunity to operate at maximum speed with minimum delays.

Sufficient operating space on the roadway or shoulder to reduce the need for either the bicyclist or the motor vehicle operator to change position when passing.

Group B—Basic Bicyclists

These are casual or new adult and teenage riders who are less confident of their ability to operate in traffic without special provisions for bicycles.

Some will develop greater skills and progress to the advanced level, but there will always be many basic bicyclists. They prefer:

Comfortable access to destinations, preferably by a direct route, using either low-speed, low traffic-volume streets or designated bicycle facilities.

Well-defined separation of bicycles and motor vehicles on arterials and collector streets (bicycle lanes or shoulders) or separate bicycle paths.

Group C—Child Bicyclists

These are pre-teen riders whose roadway use is initially monitored by parents. Eventually they are accorded independent access to the system. They and their parents prefer the following:

Access to key destinations surrounding residential areas, including schools, recreation facilities, shopping, or other residential areas.

Residential streets with low motor vehicle speed limits and volumes.

Well-defined separation of bicycles and motor vehicles on arterial and collector streets or separate bicycle paths.

Basic and child bicyclists may also choose to ride on sidewalks under certain conditions.

The Traffic Institute of Northwestern University has developed an "Urban/Suburban Street Compatibility Evaluation"³⁴ which quantifies "bicyclist stress levels" in relation to various

34 Sorten, Alex and Walsh, Thomas, *Urban and Suburban Bicycle Compatibility Street Evaluation Using Bicycle Street Level*, Paper Presented at the 73rd Annual TRB Meeting, Washington, DC, 1994.

traffic flow and roadway geometric characteristics. The key traffic flow characteristics evaluated in this study include peak hour traffic volumes, 85th percentile speed, and truck percentages. The key roadway geometric characteristics include outside lane width, parking turnover and driveway frequency.

Each traffic flow and roadway geometric characteristic is divided into parameters that are then assigned stress ratings between one and five. The parameters and stress ratings used in the Northwestern University study were based on professional judgment and limited research. The research included ratings made by bicyclists of their level of comfort or stress under varying roadway conditions. The stress ratings for each traffic flow and roadway geometric characteristic are then averaged to determine an overall stress level rating that can be applied to a particular roadway segment. This overall rating can then be used to help identify situations that may affect bicycle operation on a roadway segment.

FHWA funded the Traffic Institute of Northwestern University to further develop the bicyclist stress rating approach for evaluating bicycle compatibility on existing roadways. The Traffic Institute will concentrate on developing a comprehensive database to statistically define traffic flow and roadway geometric threshold parameters and associated stress levels.

This plan has built on the professional judgment and limited research of the Traffic Institute's approach to develop a rating system for evaluating bicycle accommodation on existing roadways in the Commonwealth. Identified are basic traffic flow and roadway geometric characteristics (variables) that are thought to have significant impact on bicycle travel:

- total traffic volume
- truck (heavy vehicle) volume
- motor vehicle speed
- outside lane width

Three of the four variables: total traffic volumes, truck volumes (truck volume includes a range of larger vehicles, such as tractor trailers, single-unit trucks, buses, etc.) and motor vehicle speed, have been selected to reflect crucial elements of the traffic flow affecting bicycle travel. The remaining variable, outside lane width, reflects the roadway geometry affecting bicycle travel within the roadway system. Traffic flow and roadway geometry are weighted equally when calculating a "bicycle accommodation" rating of a roadway. The parameters and associated ratings assigned to these parameters for the four variables selected are discussed in Appendix C.

The intent of the bicycle accommodation rating methodology is to assist planners, engineers and others in identifying existing roadways that have desirable traffic flow and cross sectional characteristics for bicycle travel. More importantly, the methodology can be used to help identify roadway improvements to better accommodate bicycle travel. Bicycles should be reasonably accommodated on all roadways where lawfully permitted.

Recent changes in MGL and MassHighway policies and practices are expected to provide opportunities for improving bicycle travel. When any roadway project is being planned and designed, bicycle accommodation must be considered where appropriate and reasonable. However, it is also important for municipalities, RPAs, and Commonwealth agencies to assess roadways' bicycling conditions and to address measures to improve conditions.

To gain a comprehensive understanding of traffic flow and cross sectional characteristics of a roadway, inventory points should be taken at all locations where the traffic flow and cross sectional characteristics change. Other factors should also be considered in a systematic evaluation of the Commonwealth's roadway system. It is recommended that bicycle accommodation rating methodologies be further refined. It should also be noted that the methodology developed in this plan is not yet established for application and will require additional testing and calibration.

Signed Bicycle Routes

Generally, it is not necessary to sign a particular roadway as a bicycle route, especially since all roads other than posted limited-access highways are open to bicycle travel. In some cases it may be useful to post directional signs to destinations. This, for example, is the case on Nantucket where bicycle routes lead from the town center to outlying bicycle paths. Routes used by touring bicyclists can be displayed on tourist maps. Roads that are well used by bicyclists and have certain shoulder and/or sight distance conditions may be posted with diamond-shaped bicycle warning signs together with "Share the Road" signs.

Massachusetts Bicycle Route 1, a signed route between Boston and Cape Cod, was created by the Massachusetts General Court as a memorial to Claire Saltonstall who was killed in a bicycle-motor vehicle accident. No other state-designated bicycle routes are currently contemplated. Any proposals for state bicycle route designation will be handled on a case-by-case basis.

MassHighway Commissioners *Policy Directive P-97-001* regarding bicycle route signing on state

highways was issued in June, 1997, and is found in Appendix C.

Bicycle Path Development

Needs

Existing Massachusetts laws provide the framework for developing bicycle transportation facilities in former rail and other corridors. To provide a more extensive trail network which may both supplement the roadway system and serve the current needs of less proficient bicyclists, the following steps are needed:

- assess the potential for use of former rail and other corridors in the Commonwealth
- develop a statewide plan which evaluates routes that can serve as bicycle paths
- acquire rights-of-way that can serve as important links in the bicycle transportation network
- develop a "How-to Guide" which addresses the various aspects of bicycle path development in Massachusetts.

Recommendations to address these needs are contained in Chapter 5.

Opportunities

Bicycle paths may be situated along abandoned railroad corridors, utility corridors, or roads, rivers, canals, and aqueducts. In the case of an abandoned rail corridor that has been converted to public use as a bike path, the tracks and ties are generally removed and a path is constructed for bicycling.

Bicycle Program Examples

A Guide to America's 500th Rail-Trail The Minuteman Bikeway



Arlington • Lexington • Bedford
Massachusetts

Massachusetts has nine of the nation's 816 rail trails, including the nation's most popular, the Minuteman Commuter Bikeway, which a study shows may average 2 million bicyclists per

year.³⁵ These rail-trails can provide convenient corridors for the most popular form of personal travel trips. According to the U.S. DOT's National Bicycle and Walking Study, nearly 50 percent of all personal travel trips are less than 4.8 kilometers long (3 miles), and personal business trips, such as doctor visits, household errands and visits to friends, account for 41.5 percent of all trips. These types of short distance trips are well-suited to travel by bicycle.³⁶

There are several ways to investigate the opportunities available for development of rail-trails, including examining the state's policies toward rail corridor abandonment and acquisition, assessing the availability of unused or former railroad corridors, and examining the potential for development of a bicycle and pedestrian facilities network through plotting the location of existing rail-trails and proposed projects.

One way to examine rail-trail conversion opportunities is to assess the number of miles of former railroad corridor in the state. One source of abandonment information is the listing of Surface Transportation Board (STB) approved abandonments. The STB (formerly known as the Interstate Commerce Commission) is the federal agency that regulates Class 1 railroads and provides a state by state listing of approved rail corridor abandonments. According to these records, approximately 225 miles of railroad corridor have been abandoned in Massachusetts since 1982. Limited information is available on older abandonments. However, at least some of the railroad corridors abandoned prior to 1982 may still be available for rail-trail development.

35 Data on use of the nation's rail trails was compiled by the Rails to Trails Conservancy. A count conducted in 1993 by the Planning and Community Development Department, Town of Arlington, MA, showed 6,000 bicyclists per day on the bikeway.

36 National Bicycle and Walking Study, Federal Highway Administration, Washington, DC, 1992.

Trails can also be developed along rivers, canals, aqueducts, and utility corridors. Agencies and organizations with trail responsibilities should explore the transportation-related opportunities provided by these types of corridors. The Dr. Paul Dudley White Bicycle Path, along the Charles River, one of the state's oldest bikeways, is extremely popular for bicycling and other uses. In some locations multiple paths run parallel, providing opportunities to separate different uses.

Massachusetts has already developed a number of canal corridor trails. The Lowell and Blackstone canals have converted some portions of their former tow-paths to trails, and managers of the Middlesex Canal are currently working to develop a trail along that corridor.

Design, Construction, and Maintenance Practices

Introduction

Bicycles are "two-wheel nonmotor-powered vehicles"³⁷. Persons operating bicycles "have the right to use all public ways in the Commonwealth except limited access or express state highways where signs specifically prohibiting bicycles have been posted."³⁸ Bicycles are "subject to the traffic laws and regulations of the Commonwealth" as well as special regulations contained in Chapter 85, Section 11B of the Massachusetts General Laws. One of these special regulations allows bicycles to be "ridden on sidewalks outside business districts when necessary in the interest of safety, unless otherwise directed by local ordinance. Persons operating a

bicycle on a sidewalk are required to yield the right of way to pedestrians."³⁹

The following bicycle-related definitions are contained in the Massachusetts General Laws, Chapter 90E, Bikeways:

- "Bicycle", a two-wheel nonmotor-powered vehicle.
- "Bike path", a route for the exclusive use of bicycles separated by grade or other physical barrier from motor traffic.
- "Bike lane", a lane on a street restricted to bicycles and so designated by means of painted lines, pavement coloring or other appropriate markings.
- "Bike route", a roadway shared by both bicycles and other forms of transportation designated by the means of signs or pavement markings.
- "Bikeway", bike paths, bike lanes and bike routes.
- "Bicycle parking facility", a facility for the temporary storage of bicycles which allows the frame and both wheels of the bicycle to be locked so as to minimize the risk of theft and vandalism.

All roadways in the Commonwealth, other than those limited access or express state highways where signs specifically prohibiting bicycles have been posted, are "shared roadways" where bicycles and motor vehicles share the same travel lanes. Most bicycle travel in the Commonwealth occurs on shared roadways.

The presence of a bicycle lane or a bicycle path adjacent to a roadway does not preclude bicycles from operating in the regular travel lanes of the roadway. For example, where bicycle lanes are present, bicyclists must leave the bicycle lane to turn left or pass slower bicyclists. In addition, they often leave the bicycle lane to avoid motorists opening car doors when parallel parking is

³⁷ Massachusetts General Laws, Chapter 90E, Section 1.

³⁸ Massachusetts General Laws, Chapter 85, Section 11B.

³⁹ Massachusetts General Laws, Chapter 85, Section 11B.

located next to the bicycle lane. Bicycle paths parallel to roadways are often crowded. In these locations, some bicyclists may prefer to ride on nearby roadways.

The following sections summarize current guidance in the Commonwealth related to roadway design to accommodate bicycles and to the design of off-road bicycle facilities.

Roadway Design

MassHighway's most recent guidance on roadway design is contained in the *MassHighway Design Manual (1997 Metric Edition)*. The manual contains the following guidance on bicycle accommodation on roadways:

12.1.3 Shared Roadways. Shared roadways are highways where a bicycle lane is not designated, but where bicycles are legally allowed to use the highway. The designer must make every effort to provide for the accommodation of bicycles on all of these facilities. Normally the minimum paved roadway widths found in Tables 5.1 and 8.2 are sufficient. When the standard roadway width cannot be provided, at least 5.0 meters of combined outside travel lane plus usable shoulder (curb lane) is required for bicycle accommodation. When this is not feasible a 4.5 meter paved curb lane should be provided. A 0.5 meter offset to vertical objects, such as guardrail, is required beyond the paved usable shoulder. Bicycle-safe drainage grates must be used.

Bicycle accommodation waivers are required for curb lane widths below 5.0 meters, 4.5 meters, or Table 8.2 values (if applicable).

Current MassHighway design guidance on shared roadways is illustrated in Figure 3.

An important aspect of the roadway design guidance on bicycle accommodation is the concept of usable shoulder. AASHTO defines "usable shoulder as the "shoulder" required for design. An additional 0.5 meters (1.6 feet) is required as an offset from usable shoulder to vertical elements taller than 200 mm (7.9 inches).

When determining the appropriate width of roadway shoulder, additional width must be provided as an offset from curbs and other vertical elements. Bicyclists should be provided sufficient lateral space so that they do not have to come too close to curbs, guard rails or walls. The offset provides an important margin of comfort and safety for the bicyclist.

An example of bicycle lanes on an urban arterial (Massachusetts Avenue in Cambridge) is illustrated in Figure 4.⁴⁰

MassHighway recognizes the *Guide for the Development of Bicycle Facilities* (the *Guide*)⁴¹ as "the primary design reference for designing bike-ways."⁴² According to MassHighway:

The *Guide* provides design guidance that must be supplemented with the designer's judgment and consideration of the particular site conditions. Part IX of the *Manual of Uniform Traffic Control Devices (MUTCD)* is devoted to "Bicycle Facilities" and should be used in conjunction with the *Guide*.

The MassHighway manual *Building Better Bicycling*, 1994, should also be consulted when considering bicycle facilities.⁴³

40 In some situations in Cambridge with 4.3 m wide travel lanes in each direction adjacent to a parking lane, the City has chosen to paint the edge line so as to create an 3.4 m wide travel lane and a 0.9 m offset from the parking lane. Cambridge does not denote the 0.9 m space as a bicycle lane, and uses the "guide line" to guide the motorist away from the right edge to provide operating space for bicyclists. For more information see: Seiderman, Cara. "Striping Bike Lanes: Overcoming Implementation Challenges in Urban Area," *Proceedings of the Ninth International Conference on Bicycle and Pedestrian Programs*, pages 33 - 38.

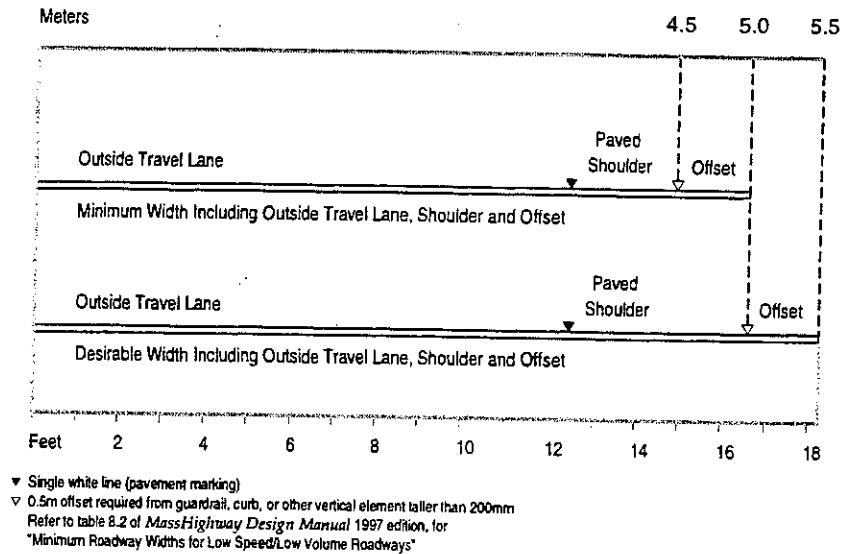
41 American Association of State Highway and Transportation Officials (AASHTO), 1991.

42 Massachusetts Highway Department, *Highway Design Manual*, 1997 edition, page 12.01.0.

43 Ibid.

Figure 3

Roadway Design to Accommodate Bicycles (Outside Curb Lane Including Travel Lane, Shoulder and Offset)



The *Guide* and the *MUTCD* provide design guidance related to on-road bicycle facilities, such as bicycle lane pavement markings, signing, and intersection treatments. The *Guide* also provides extensive design guidance for off-road bicycle facilities, which are discussed in the next section.

Off-road Bicycle Facility Design

Three of the most critical elements of the design of bicycle paths are:

- width
- side clearance
- separation from motor vehicle traffic

AASHTO's current guidelines recommend a paved width of 3 m (10 feet) for a typical two-way bicycle path. This guideline further suggests that under some conditions, a 2.4 m (8 feet) wide paved path may be adequate, but stresses

that this is a minimum and all conditions must be met in order to allow this width. Additionally, AASHTO recommends that in cases of heavy bicycle usage or probable shared use, a path width of 3.6 m (12 feet) is desirable.⁴⁴

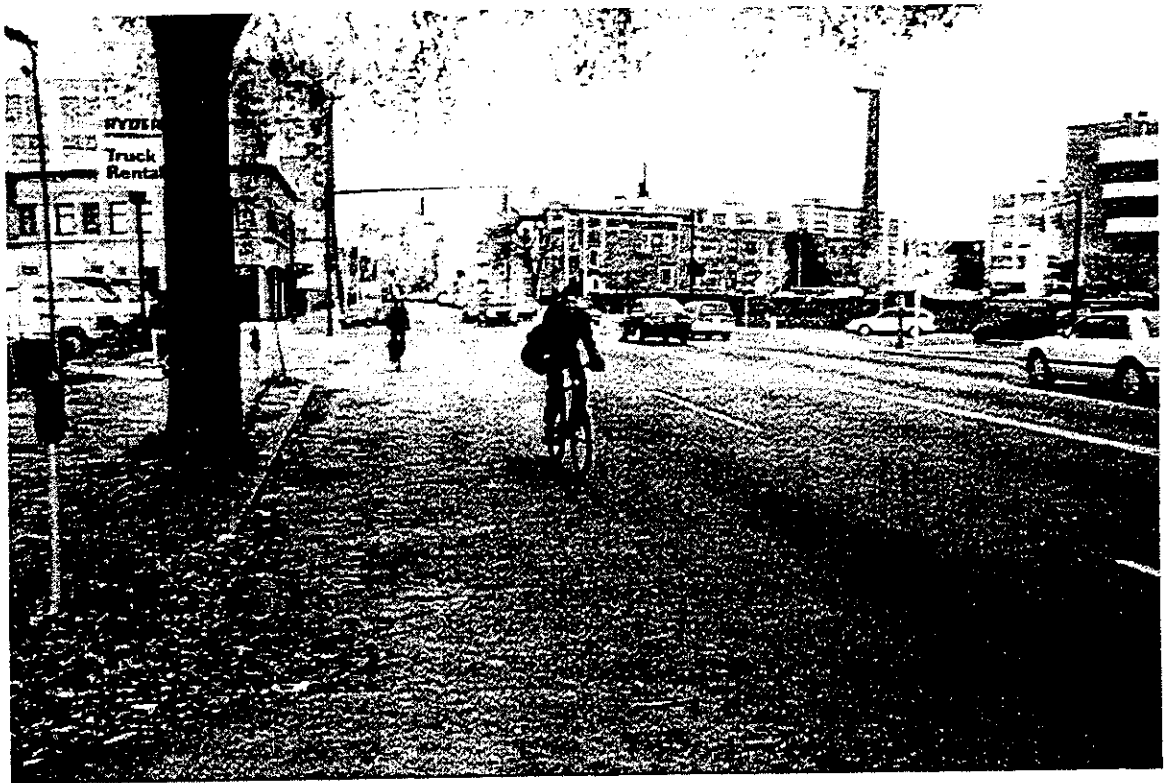
In addition to the width of paths, the current AASHTO *Guide* recommends that a cleared shoulder area be maintained on either side of the pavement in order to provide clearance from trees, utility poles, and other vertical obstacles. This clearance standard recommends a 0.6 m (2 feet) graded area in most cases; however, a 0.9 m (3 feet) clearance is considered more desirable.⁴⁵

The AASHTO *Guide* recommends that for safety reasons at least 1.5 m (5 feet) of distance between the path and the roadway should be maintained. The *Guide* also goes into detail as to

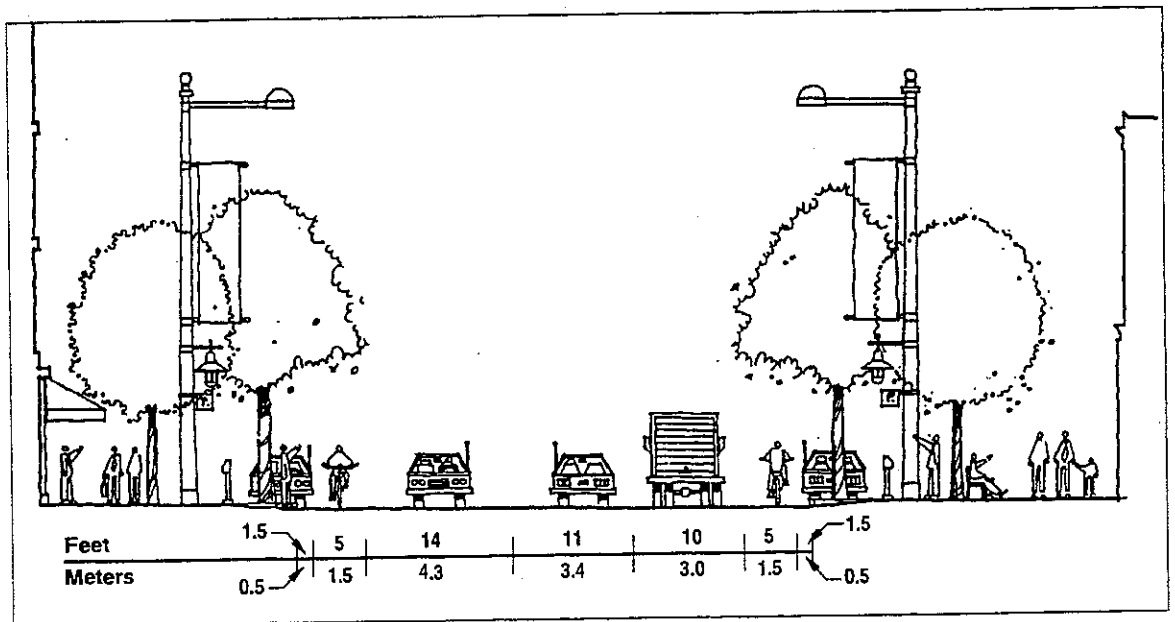
⁴⁴ *Guide for the Development of Bicycle Facilities*, American Association of State Highway and Transportation Officials, 1991, Washington, DC.

⁴⁵ AASHTO, 1991.

Figure 4 Bicycle Facility Design Example



▲ Existing Roadway



▲ Proposed Bicycle Lanes (adjacent to parking lane)
Massachusetts Avenue, Cambridge

why sidepaths directly adjacent to the roadway are undesirable. In cases when the separation between path and roadway is less than 1.5 m (5 feet), installation of a physical barrier should be considered. Any barrier that is installed should be no more than 1.4 m (4.5 feet) tall so that it does not become a vertical obstruction in and of itself.⁴⁶

While AASHTO's guide is referenced in the *MassHighway Design Manual*, other guidance is available. "Building Better Bicycling" includes trail design guidance. The Rails-to-Trails Conservancy (RTC) manual on trail planning, design and maintenance also addresses these issues.⁴⁷

Many trails originally developed for bicyclists did not fully anticipate the latent demand for such facilities. Many trails are becoming increasingly popular. New trails can be designed for greater use and can incorporate best practice design features as a way to reduce potential conflict. Existing trails can incorporate some of these same design features as retrofits. Two potential ways to reduce conflicts are:

- Design trails with adequate width to accommodate use.
- Provide signage along the trail that directs users as to the rules of the trail. For example, the Minuteman Commuter Bikeway provides signs that say: "All users keep right except to pass."⁴⁸

These design features are covered in current AASHTO guidance and the FHWA publication, *Conflicts on Multiple-Use Trails*.⁴⁹ However, this

is by no means an exhaustive list. Trail use is one of the most important issues facing bicycle and pedestrian planning today, and more consideration needs to be given to providing adequate solutions to trail user conflicts.

In addition to reducing trail use conflicts, more attention should be directed to the integration of on-road and off-road facilities (including how to better integrate the beginning and ending points of the trail with on-road facilities, and the design of trail-roadway intersections), and best practices of trail construction and maintenance. The National Bicycle and Pedestrian Clearinghouse provides technical briefs on the subjects of trail design, maintenance, and user conflicts. The most current publication on the issue of trail-road intersection design, *Trail Intersection Design Guidelines*⁵⁰, was produced in 1996 for the Florida Department of Transportation by the University of North Carolina Highway Safety Research Center.

Safe transitions between off-road trails and on-road facilities require consideration of several special safety issues. The designer must be cognizant of the fact that the intersection is a junction between two distinct facilities carrying different modes of transportation. The trail user must have adequate warning that the exclusive path is about to end and a shared roadway is beginning. Likewise, the roadway user must be made aware of the changes. Design parameters for one vehicle or user type, may not be appropriate for others and balancing of several dissimilar aspects is often required.

As with any intersection, the pavement markings and signing must provide advanced warning of the approaching intersection as well as

⁴⁶ AASHTO, 1991.

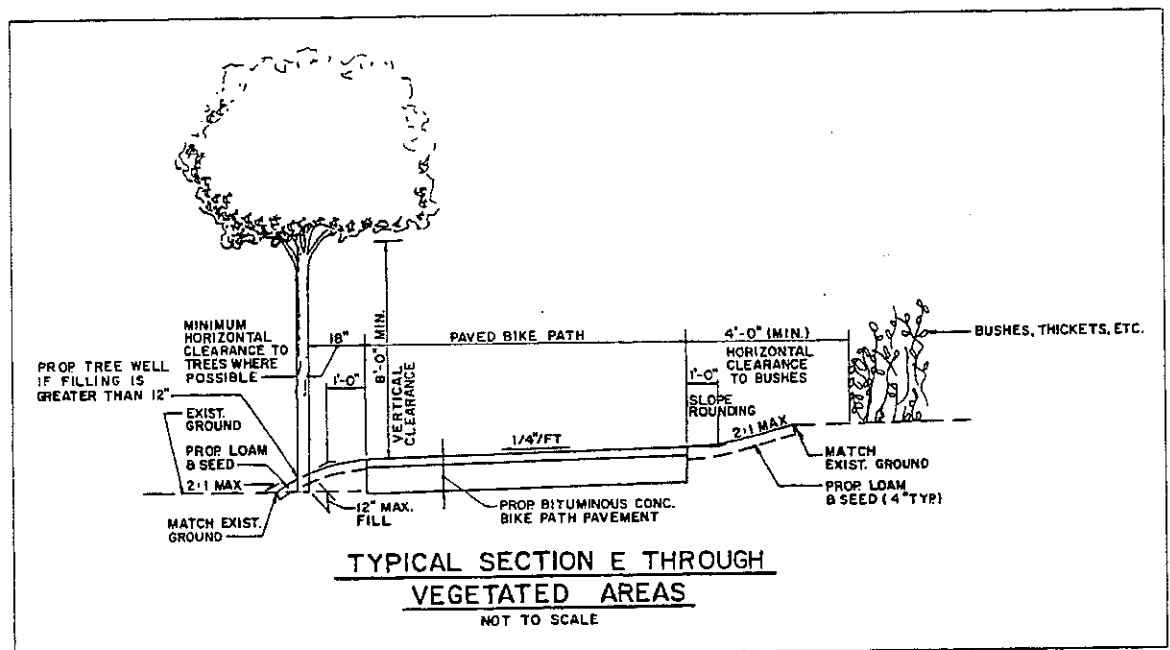
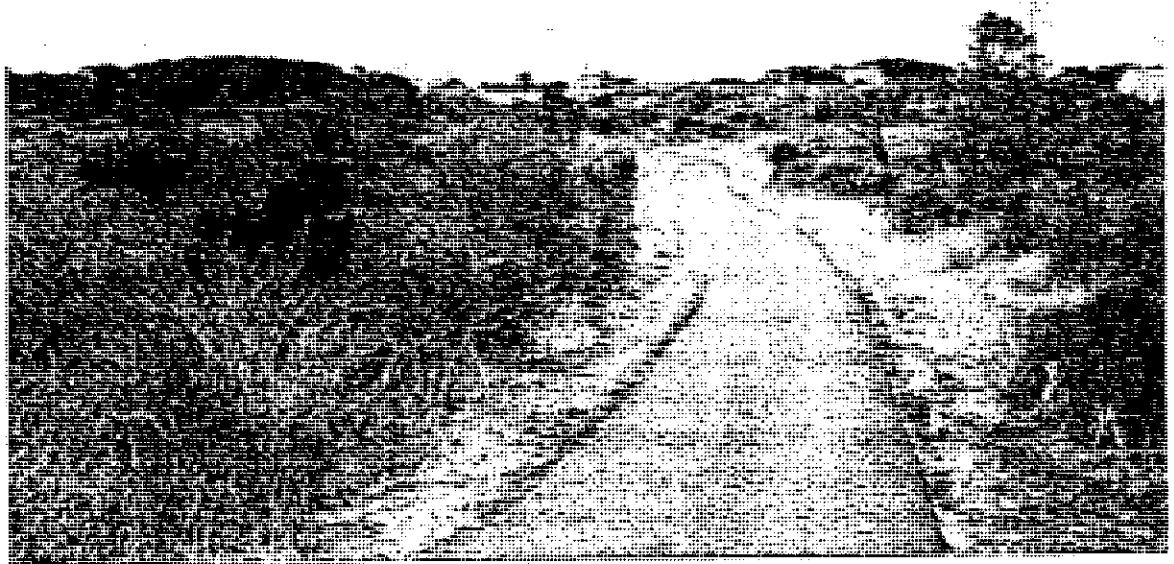
⁴⁷ *Trails for the 21st Century: Planning, Design, and Management Manual for Multi-Use Trails*, Rails to Trails Conservancy, 1993.

⁴⁸ *Resolving Trail User Conflict*, National Bicycle and Pedestrian Clearinghouse Technical Brief #8, March 1996, Washington, DC.

⁴⁹ Moore, Roger L., North Carolina State University (FHWA-PD-94-031), August 1994.

⁵⁰ University of North Carolina, Highway Safety Research Center, *Trail Intersection Design Guidelines*, 1996.

Figure 5 Bicycle Facility Design Example



▲ Madaket Bike Path, Nantucket
Town of Nantucket
Designed in 1987 by VHB, Inc.

information on how to respond to the changes ahead. The intersection location must be carefully chosen and landscaping and sight distances must be compatible with the overall design. Transition aprons must be provided, especially when the trail is constructed of a different material than the roadway. This change in materials and apron design can serve as additional, highly visible warning that there is an intersection ahead. Drainage at intersections can be a special concern since trail users are often more affected by puddles than motorized vehicles.

Several elements must be addressed in designing a functional intersection between on-road and off-road facilities. Access for emergency vehicles must be provided, but under normal circumstances, motor vehicles must be prevented from entering the off-road facility. Also, path users are subject to traffic controls, such as signs at the intersection. An approach that conforms to MUTCD, AASHTO and other guidance is required in these situations.

In the planning and design of off-road bicycle facilities consideration should be given to providing features, such as:

- motor vehicle and bicycle parking at trailheads
- rest rooms
- rest areas, benches, water fountains
- use signs
- interpretive signs

Construction and Maintenance Practices

Consideration should be given to existing bicycle traffic during the construction of both on-road and off-road facilities. During the construction of off-road facilities, steps should be taken to limit access to the trail until completion; however, it should be recognized that, unlike

motorized vehicle operators, bicyclists may be very difficult to keep completely out of a construction site. Construction techniques and safety programs should include provisions for the occasional bicyclist previewing the new trail. In addition, proper safety measures should be taken during regularly scheduled maintenance.

The first step in ensuring the safety of bicyclist during construction of on-road facilities is the development of a detailed maintenance and protection of traffic plan that recognizes their needs. Checklists should be developed to help prepare and evaluate the plan both before the start of construction and periodically during construction on larger projects. The checklist might include such items as:

- Provision for a smooth travel path
- Provision for lane width
- Consideration of bicyclists in detour routes
- Sweeping of construction debris
- Marking surface irregularities
- Asphalt ramping
- Bicycle-specific construction signs

In addition to the development and implementation of a maintenance and protection of traffic plan, bicyclists should be informed of the proper methods of operating their bicycles in construction and maintenance zones. Such information can be provided through publications, signs and training programs.

In addition to the construction phase, the importance of a maintenance and protection of traffic plan for use during routine maintenance should be considered. All items listed above would apply to the routine maintenance plan, as well as training of fleet drivers to look for bicyclists in and around the work zone.

Standards and procedures for maintenance should be reviewed and updated as required to

accommodate the needs of bicycles. Since bicycles travel on two relatively high pressure, narrow tires, they are much more sensitive to obstacles and variations in road surfaces than many other vehicles. Providing a suitable travel path during and after completion of routine maintenance might include the following:

- Road and path sweeping
- Maintenance of storm drainage structures
- Signing and striping
- Control and use of vegetation
- Utility and railroad maintenance operations
- Timely, accurate replacement of striping
- Overlays extending to edge of road instead of edge of travel path
- Surface type compatible with bicycle travel (at least in bicycle travel paths)
- Consistency and compatibility of materials

Two of the most important maintenance issues requiring additional attention to accommodate the needs of bicycles are sweeping and storm drainage structure maintenance. Standards for evaluating the reoccurring needs for sweeping can be developed and implemented. More frequent sweeping may be required depending on bicycle volumes and local conditions. Current grate replacement programs can be modified to incorporate the installation of bicycle safe grates. Proper cleaning of catch basins to avoid the formation of standing water can also be considered.

Policies and practices for routine maintenance can make use of wet skid resistant pavement markings, provide new pavement markings soon after completion of the project, and proper placement of all signs to facilitate bicycle movement and the awareness of motorists that bicyclists are in the area. Additionally, provisions can be made for temporary crossing zones as required by construction. Consideration can also be given to bicyclists in the choice of sign post materials and types to minimize injuries in

case of collision. Guidelines for the assessment of placement and condition of signs and stripes can be developed using a frequency appropriate to address the needs of bicyclists.

Effective mowing programs adjacent to roadways and paths can be developed and implemented to address the needs of bicyclists. Mowing programs can be expanded to include consideration of the sight line requirements of bicyclists, especially at intersections with off-road facilities. Criteria can be established for effective tree and shrub control to provide proper overhead and adjacent clearances required by bicyclists. Proper trimming of vegetation is also required to ensure signage is visible. Tree pruning can be done in a manner to provide adequate recovery space for bicyclists. In addition, pruning techniques can be used to eliminate sharp branch edges adjacent to the path of bicyclists. Trails and their thinner pavements are inherently more susceptible to root damage. Potential problem areas can be identified and preventive measures can be implemented (i.e., root barriers, tree removal, alternate path selection, pruning, etc.)

The importance of safety and compatibility with bicycle traffic can be stressed to utility and railroad companies to heighten awareness. Utility companies and designers can be trained to consider bicycles during maintenance and placement of utilities.

Recommendations for bicycle sensitive maintenance and protection of traffic plans and other specific techniques and products listed above can be applied to utility and railroad work. In addition, railroad companies and their designers can develop standard railroad crossing details and specifications to include rubberized crossings, signalization, protection, proper angle of approach, sight lines, and other design features considering bicycle traffic.

The final element in any successful construction and maintenance program is the inclusion of a method for receiving and using public feedback. This feedback can be divided into two major categories. The first category is that requiring immediate maintenance action. Establishing methods to report areas needing immediate maintenance (e.g., potholes and debris) is recommended. The second category of feedback is suggestions or items that may need corrective action or maintenance, but do not present immediate concern. Users should have an opportunity to communicate ideas and suggestions relating to facility improvements. Establishing methods for existing organizations to receive, evaluate and distribute these suggestions for action is recommended. A system to track improvements can be developed to eliminate repeat items and ensure public awareness of progress.

Transit and Multimodal Connections

There are opportunities to decrease single-occupant automobile use by improving access to other modes of travel. One key to this shift is improved multimodal connections. Bicycle use can contribute to a greater utilization of buses, trains, carpools, vanpools, ferries, and other maritime services. Improvements in bicycle accommodation in three areas can be encouraged:

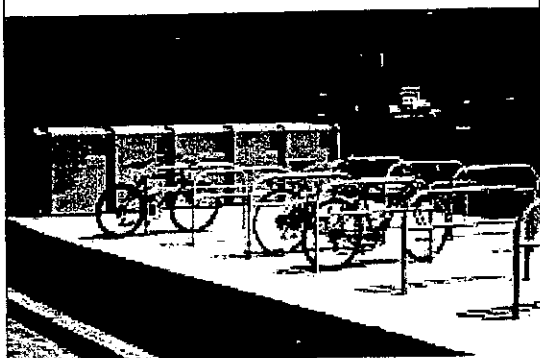
- bicycle access to transit centers and other multimodal sites including park-and-ride lots
- bicycle parking at transit stations and other multimodal sites
- conveyance of bicycles on transit vehicles and other common carriers

Many transit patrons commonly walk to transit from nearby neighborhoods. The service area of a bus route or rail line can be significantly expanded by encouraging people to bicycle to a bus stop or train station. The same holds true for park-and-ride lots. Relatively low cost improvements to better accommodate bicycle travel on roadways leading to major transit stops or multimodal centers can lead to increased transit and carpool use. New multimodal centers can include linkages to existing paths, and new paths for pedestrians and bicyclists can be included. These linkages are an important element of the multimodal transportation system.

The second type of improvement is bicycle parking. People who bicycle from their home to a transit stop need a safe and secure place to leave their bicycle. Different types of bicycle parking facilities are appropriate at different locations, and include single-unit posts, multi-unit bicycle racks, bicycle lockers, and covered/secure facilities for parking large numbers of bicycles. Long term parking, such as at transit stations, should provide for both security and weather protection.

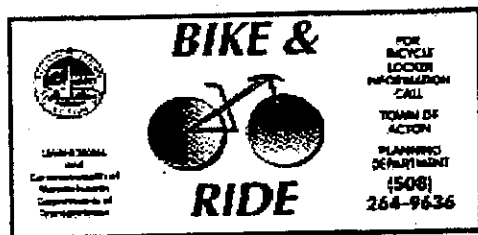
Massachusetts has 16 regional transit authorities (RTAs). The largest of these is the Massachusetts Bay Transportation Authority (MBTA). Most of the RTAs do not have an up-to-date inventory of existing bicycle parking facilities, nor have they systematically evaluated bicycle parking needs at their transit stations or stops. It is essential that bicycle facility needs be incorporated in all aspects of capital and operating programs of the RTAs. A good initial step is to survey the number of bicycles parked at major transit stations during the peak periods of bicycle use. This survey will show where the existing demand for bicycle parking exceeds the supply provided at the transit station, as many bicycles

Bicycle Program Examples



Bicycle Parking is Now Available at the South Acton Train Station.

Opening for the 1996 National Bike-to-Work Week, May 20-24.



Free Bike Locker Rental in 1996, only.

**Reserve your Bike Locker -
Call (508) 264-9636 Today.**

Town of Acton, Planning Department
Acton Town Hall, 472 Main Street, Acton, MA 01720

■ Bicycle Parking Facilities at the South Acton Commuter Rail Station

The Nantucket Regional Transit Authority (NRTA) began a summer bus shuttle service in 1995 and equipped all of its buses with front-mounted bicycle racks. By August, the NRTA was carrying 60 to 70 bicycles per day.

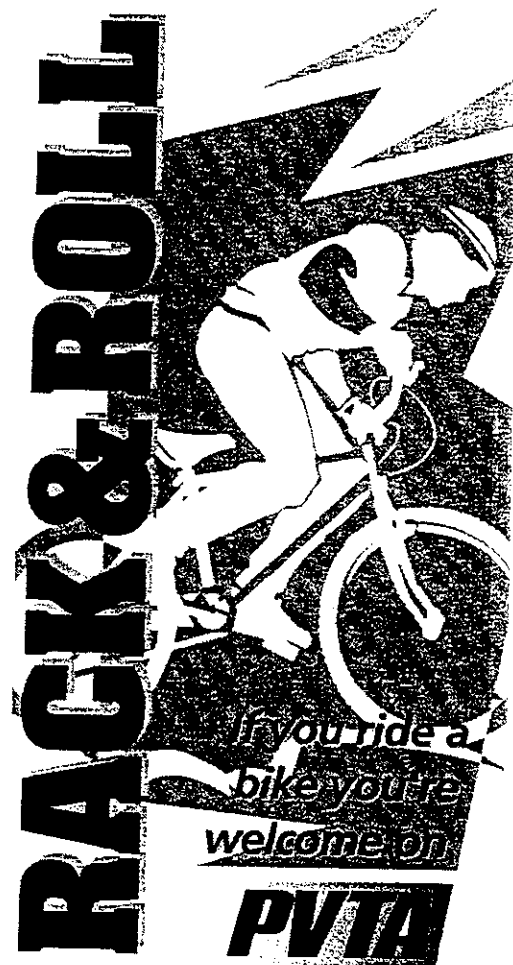
Conveyance of bicycles is another way of increasing both bicycle and transit use. For example, the Pioneer Valley Transit Authority (PVTA) initiated its bikes-on-buses program in 1996. Bicycle racks are provided on 20 buses which provide service on three major bus routes. PVTA has produced a video and brochure to promote their "Rack and Roll" program and instruct bicyclists on how to use the racks.

Also in 1996, the MBTA expanded the number of outlets for obtaining Bikes-on-the T permits and hours when bicycles are allowed on trains. Data provided in Chapter 3 shows that significant numbers of bicycles are transported on ferries to and from Cape Cod, Nantucket, and Martha's Vineyard. Bicycles are also transported on private buses and on airlines. Accommodating bicycles on all forms of public transit should be encouraged.

are commonly locked to hand rails, sign posts, and the like. Wherever significant numbers of passengers board transit vehicles, bicycle parking should be provided. Programs to expand bicycle parking can be set up in a similar way to existing bus shelter programs. Safe, secure, and adequate bicycle parking facilities should also be provided at park-and-ride lots, airports, and other multi-modal facilities.



Bikes on Buses Programs on Nantucket (top) and in the Pioneer Valley (right)



Bicyclist Safety Education and Enforcement

Introduction

To assist the development of the Massachusetts Statewide Bicycle Transportation Plan, the University of North Carolina Highway Safety Research Center (HSRC) reviewed and summarized existing and planned education and enforcement programs in the state aimed at improving bicyclist safety. Working with the MassHighway Bicycle and Pedestrian Coordinator, HSRC project staff identified 30 individuals to contact for input to the task. Names were drawn primarily from the rosters of the Massachusetts Bicycle Safety Alliance and the Technical Advisory Committee for the plan.

Appendix A contains a listing of the individuals contacted, along with their affiliations. The list includes representatives from the Governor's Highway Safety Bureau (GHSB), the Department of Public Health (MDPH), and MassHighway, along with police officers, pediatricians, nurses, teachers, and private citizens. HSRC contacted each person and scheduled a telephone interview during which the following were addressed:

- their current and planned bicycle safety education and/or enforcement activities;
- their thoughts regarding bicycle safety needs in the Commonwealth; and
- their recommendations regarding how these needs could better be addressed, particularly within the scope of the Statewide plan.

This portion of the plan summarizes what was learned about the current status of bicycle safety education and enforcement activities in the Commonwealth and highlights identified needs. Recommendations regarding future programs and activities are found in Chapter 5.

Background

Each year in the United States approximately 800 bicyclists are killed and 60,000 injured in collisions with motor vehicles.⁵¹ Many more bicyclists are injured in falls and collisions not involving a motor vehicle. Over half a million bicyclists are treated each year in hospital emergency rooms.⁵²

In Massachusetts an average of 10 bicyclists have been killed in collisions with motor vehicles during each of the past five years, according to Registry of Motor Vehicles data. Half of the fatalities involved children under the age of 19. In addition, over 1,500 bicyclists have been reported injured in accidents each year. Of these, 56 percent involved children. Bicyclists typically comprise between 1.8 and 2.7 percent of the state's total traffic fatalities, a figure close to the national average.

Although these numbers represent a significant safety problem, they do not adequately convey the true extent of bicycle safety needs in the Commonwealth. Many more bicyclists are being injured each year in accidents and falls that are not captured on the statewide crash files. These include falls or collisions that do not involve a motor vehicle, those that occur off public roadways (in parking lots, driveways, parks, etc.),

51 U.S. Department of Transportation, National Highway Traffic Safety Administration (NHTSA), "Traffic Safety Facts 1994."

52 Rodgers, GB. "Bicycle helmet use patterns in the United States: A description and analysis of national survey data." *Accident Analysis and Prevention*, 27(1):43-56, 1995.

and those that for one reason or another fail to get reported. It has been estimated that as much as 80 percent of bicyclist injuries serious enough to require emergency room treatment are not reported on statewide accident files.⁵³

One excellent source of information on more serious bicycle-related injuries occurring in the Commonwealth is data compiled by the Department of Public Health on deaths and hospitalizations from the Registry of Vital Records and Statistics and the Uniform Hospital Discharge Data Set. Both databases include information on the external cause of injury (E-code), which allows identification of motor vehicle related and non-motor vehicle related bicycle injuries. During 1994 Massachusetts reported five (5) bicycle-related fatalities and 627 hospitalizations.⁵⁴ Two of the fatalities and 434 (69%) of the hospitalizations did not involve a motor vehicle. Children aged 10-14 were the most likely victims, representing one out of four cases, and males outnumbered females by a margin of three to one.

For children, bicycle-related injuries are a leading cause of hospitalization and death. Among 5-14 year-olds, 10 percent of injuries serious enough to require hospitalization in 1994 were bicycle-related, and more children in this age group were hospitalized for bicycle-related injuries than for pedestrian or motor vehicle occupant injuries.

No statewide data are available on emergency room visits in Massachusetts for treatment of bicycle-related injuries, but a national study estimated that of cases seen in emergency rooms,

four percent are admitted to the hospital.⁵⁵ Thus, one would expect 25 times as many emergency room-treated bicycle injuries as hospital inpatient injuries, producing an estimate of 15,800 (632 X 25) Commonwealth residents receiving emergency room treatment in 1994 for a bicycle-related injury.

Finally, if Massachusetts follows national trends, the number of adult bicyclists injured and killed in accidents can be expected to increase. Nationwide, only 32 percent of bicyclists killed in accidents in 1975 were age 16 or older, but by 1994 this number had increased to 63 percent.⁵⁶ The number of adults reporting bicycling regularly more than tripled in the past decade.⁵⁷

Taken together, these numbers provide strong justification for increased attention to bicycle safety education and enforcement activities throughout the Commonwealth.

Partnerships and Resources

Before describing specific programs and activities, it is important to understand which groups, organizations, government offices, and others have addressed bicycle safety education and enforcement efforts in the Commonwealth. Certainly one of the key players over the past several years has been the Massachusetts Bicycle Safety Alliance. The Alliance was formed in 1993 in response to a statewide helmet use law for riders ages 12 and that was scheduled to go into effect in March, 1994. One of its first tasks was to work with the GHSA to produce a poster and a card to educate bicycle retailers and their

53 Stutts JC, Williamson JE, Whitley T and Sheldon FC. "Bicycle accidents and injuries: a pilot study comparing hospital and police reported data." *Accident Analysis and Prevention*, 22(1):67-78 (1990).

54 These numbers may underestimate the true numbers, since E-code information was missing for 12 percent of the cases.

55 Baker SP, Li G, Fowler C and Dannenberg AL (1993). "Injuries to Bicyclists: A National Perspective." Baltimore, MD: The Johns Hopkins School of Public Health, Injury Prevention Center.

56 Insurance Institute for Highway Safety. *Fatality Facts*, 1995.

57 Bicycle Institute of America. "Bicycling Reference Book," 1994.

children safe riding habits and skills. Lesser attention has been given to bicycle law enforcement and the education of adult bicyclists and motorists. The following sections highlight key programs and activities that were identified through the interviews. At the conclusion is a list of needs that were also generated from these interviews, needs which form the basis for the program recommendations presented in Chapter 5.

Bicycle Helmet Promotion

A statewide law requiring all bicyclists ages 12 and under to wear a helmet went into effect in March, 1994. The law contains no fines or penalties for non-compliance. A poster and a card were developed to promote public awareness and acceptance of the law. Since Federal FY 94, GHHSB has spent approximately \$130,000 on bicycle safety and helmet promotion. Bureau-funded community traffic safety programs (CTSPs) have focused additional resources on bicycle safety. Within this framework, the following is an overview of some of the many helmet promotion activities that have taken place in the Commonwealth since passage of the statewide law:

- The Boston Childhood Injury Prevention Program, with Boston City Hospital and the Boston Health Department, created the "Helmet Rx" program. Special prescription pads were prepared for pediatricians at the hospital and area health centers to "prescribe" helmets for their patients. The front page of the prescription has space for recording the child's age and head circumference, along with a checkbox for noting whether he or she was counseled about helmet safety. For parents there is also a "Guardian Pledge" stating that their child will wear a helmet every time they bicycle or skate. The back side of the prescription contains tips for proper helmet use and safe

bicycling. Children can take the prescription to the hospital gift shop and purchase a helmet for just \$5.00. From April through June of 1996, 2500 helmets were distributed. The helmets were purchased in bulk, so that the program is self supporting. Word about the "Helmet Rx" program has

Bicycle Program Examples

Helmet Safety Tips

Broken bones heal, but brain injury can cause death or permanent damage.
80% of bike-related deaths are caused by head injuries.
Helmets are almost 90% effective in reducing brain injury, but...

Your helmet won't keep you safe unless it fits right!



The Massachusetts Bicycle Helmet Law states that all children under 13 years old must wear helmets while biking.

Always follow traffic rules: ride on the right, obey all traffic signs.

Don't ride or skate after dark.

Wear wrist guards, knee and elbow pads, and a helmet while in-line skating.

There is no "safe" place to ride or skate. Most bicycle crashes occur in parks, on bike paths, driveways and "quiet" residential streets.

Wear your helmet every time you ride a bike or in-line skate!

Helmet Rx

This prescription could save your child's life!
Bring it to the Boston City Hospital Gift Shop to purchase
a quality bike helmet for just \$5.00

A health provider must fill in the following information:

Child's head circumference in inches _____ Date _____
Provider's signature _____ age _____
Print provider's name _____
Site of visit _____
Has patient been counseled about helmet safety? ☐ yes ☐ no

Guardian Pledge:
I understand the importance of helmet safety. I pledge
that my child will wear his/her helmet every time he/she bikes or skates.
Guardian's signature _____

See back for helmet safety tips

For more information about the Helmet Rx Program
and bike safety, call (617) 534-5197

The Helmet Rx Program is sponsored by: The Boston Childhood Injury Prevention
Program, BCH Pediatrics, Volunteer Services, and the BCH Gift Shop

■ Boston City Hospital Helmet
Rx Program

customers about the law. Since then the Alliance has continued to serve as a focal point for bicycle helmet promotion and safety activities in the Greater Boston area and throughout the state.

The Alliance consists of a core group of, at present, over 40 individuals representing a broad mix of interests and backgrounds. Members meet on a monthly basis to collaborate on a variety of helmet and bicycle safety initiatives and to share information and resources. The Alliance functions both as individuals and as a group; individual members pursue their own interests and professional responsibilities, but draw assistance and support from one another. Members also use the Alliance as a basis for networking and publicizing their materials, programs and activities.

The majority of the programs and activities that will be described later in this section have been created or led by Alliance members. Although charged with promoting bicycle helmet use and safety awareness in the Commonwealth, the Alliance receives no funding for its programmatic efforts. It is currently chaired by Injury Prevention and Control Program staff in MDPH, and receives operational support from that Department.

The Injury Prevention and Control Program has itself been a key player in Massachusetts' bicycle safety efforts. In addition to providing overall coordination to bicycle safety efforts in the Commonwealth, the program has led in the development and evaluation of new programs and activities. Through its networking with the medical community, local health departments and prevention centers, SAFE KIDS, schools, and the law enforcement community, it is able to extend its influence and further the goals of bicycle safety.

A third key player is the GHSB, the focal point for all of the state's highway safety related activities. Alongside the MDPH Injury Prevention and Control Program, GHSB has played a leading role in producing safety materials and educating the public about the bicycle helmet law and the importance of wearing a helmet. It has also provided funding through its minigrant program to support local efforts such as mass helmet purchases and bicycle safety rodeos.

Volunteer organizations have also played an important role in promoting bicycle safety in the Commonwealth. Massachusetts has two very active **SAFE KIDS** coalitions -- the Greater Boston **SAFE KIDS** and the Western Massachusetts **SAFE KIDS**. Each has independently pursued a variety of helmet promotion and children's bicycle safety activities, drawing upon a wide network of volunteers as well as professionals. As other examples, the **Lexington Bicycle Safety Program** has been the source of many creative bicycle safety materials and programs, and **Kiwanis Clubs** in Massachusetts and throughout New England have joined in support of children's bicycle safety through their sponsorship of pediatric trauma centers and "Kiwanis Family Safety Day" programs.

As a final note, each person contacted was an active contributor and supporter of bicycle safety in their community or on a broader statewide level. It is this personal level of commitment, beyond simply one's job or professional responsibilities, that is a key to creating a safer bicycling environment.

Programs and Activities

Bicyclist safety education and enforcement programs and activities in Massachusetts have predominantly focused on (1) increasing helmet use, especially among children, and (2) teaching

spread, and it is likely to be adopted by other hospitals.

- The Boston SAFE KIDS Coalition also purchases helmets in bulk so that it can make them available at a reduced price or even for free. During SAFE KIDS week, helmets were distributed and fit on over 800 children at an elementary school where an 11-year-old boy had been killed the year before in a bicycle accident. Many individuals and groups have received assistance from SAFE KIDS in purchasing and ordering helmets for their programs at greatly reduced prices.
- Similarly, the Massachusetts Trial Lawyers Association has joined with the Auxiliary of the Massachusetts Medical Society in a helmet promotion and giveaway targeting low income children and members of Boys and Girls Clubs. Begun locally in 1994, the program has expanded to become a regional program.
- The "Bike Safety in a Can" curriculum developed by the Lexington Bicycle Safety Program includes a very effective "Egg Helmet" demonstration for convincing elementary school age children to wear helmets. The demonstration is part of a bicycle safety assembly presentation that includes transparencies, videos, demonstrations, and safety handouts. (For middle school age children, a "Jell-O Brains" demonstration has been developed.) The curriculum also includes a video for teaching physical education teachers and others how to properly adjust and fit bicycle helmets on children.
- The Massachusetts Brain Injury Association has developed the "Think A-HEAD" program for elementary school age children to teach lifelong habits for preventing brain injury. The program stresses the importance of wearing a helmet when bicycling or skating and proper helmet use. The Association was also able to train instructors to present a program entitled, "If You Had Any Brains You'd Protect Them!" The program was presented to over 8,700 3rd and 4th graders during the 1995 and 1996 school years.
- The Injury Prevention and Control Program developed the "Prevention Pays" flier, modeled after a New York State Health Department flier that documented the costs incurred as the result of one child's head injury, and what these costs could purchase in terms of prevention. The case study presented in the Prevention Pays flier is an unhelmeted skater, but the numbers make good economic sense to anyone whose head should be protected by a helmet. The Injury Program also developed a Tricycle Helmet Advisory in 1994 and distributed it to all child care providers in the state.
- GHSB has distributed over 350,000 of its "Bike Smart" cards containing the "Bike Smart -- Wear a Helmet" message on the front and tips for safe bicycling and bicycle helmet selection and fit on the back. GHSB is currently redoing both the card and a bicycle helmet poster they originally developed for display in bicycle shops, making it more general so that it can be sent out to schools as well. GHSB also plans to survey school districts to assess policies regarding helmet use, then follow up with recommendations regarding "best practices."
- In the past GHSB has provided funding to the Kiwanis and other Alliance members as well as cities and towns to support the purchase of helmets and helmet promotion and bicycle safety programs. GHSB funded the Boston Safe Kids/ Childhood Injury and Prevention for materials and helmets in FY 95, as well as the Lexington Bike Safety Program to distribute its bike safety curriculum and fund raising kits. GHSB will strengthen its bicycle safety program in the future by increasing the resources its statewide network of Community Traffic

Safety Programs allocated to bicycle safety programming.

In addition to these specific programs and activities, helmet promotion is also an integral part of many of the more general bicycle safety education and enforcement activities highlighted in the sections below.

Bicyclist Safety Education

The majority of bicyclist safety education activities in the Commonwealth have been directed towards young children and include many of the same "key players" identified above for the helmet promotion activities. Bicycle rodeos, school assemblies, safety videos and PSAs have all been used to help teach and encourage safe riding behaviors. Following are highlights of individual programs that were identified through the telephone interviews.

- The Kiwanis Family Safety Day program has grown from a local effort by the Kiwanis Pediatric Trauma Institute and Childhood Injury Prevention Program at the New England Medical Center to a national model for any community organization wanting to sponsor a bicycle safety rodeo. The Trauma Institute makes available a complete Kiwanis Family Safety Day package containing a detailed "how-to" manual and 200 copies each of a variety of safety brochures, activity sheets, and other materials. The program has run annually since 1994, usually timed to coincide with Mother's Day weekend. In the first year 50 clubs signed up to participate, in the second year 100, and this past year 138. The program has recently expanded to make its materials available to any community organization wanting them, including police departments, Rotary clubs, and Boy Scouts. The GHBS provided approximately \$43,500 to support Kiwanis Family Safety Days in Federal FY 95 and 96.
- The *Boston Globe* "Creating Safe Kids" campaign was a highly successful public information and education effort involving the Boston SAFE KIDS coalition, the American Academy of Pediatrics, NHTSA, and several members of the Bicycle Safety Alliance. A series of six ads was created that ran more than 90 times in the *Globe* over a period of seven months in 1995. Bicycle safety was one of the six focus areas. In addition to the ads, the campaign produced 50,000 brochures promoting children's bicycle safety and wearing of helmets.
- The Lexington Bicycle Safety Program produced some bicycle safety PSAs of its own during 1991-1992. Celtics stars Robert Parish and Dee Brown participated in the promotion, and everything, including camera and crew time, was donated. The stars have been featured on fliers and folders for organizing school work as well.
- The "Bicycle Safety in a Can" curriculum is designed for elementary school age children and includes everything needed for a 45-minute bicycle safety assembly program and a follow-up physical education class for learning proper helmet fit. The curriculum is being used in a number of schools throughout the Commonwealth. In addition, plans are underway to package and market a curriculum for middle school aged children that was piloted during 1996.
- The Lexington Bicycle Safety Program also markets a manual on how to fund a community bicycle safety program. The manual describes how an organization can use bicycle safety presentation folders that have space on the back for acknowledging program sponsors to obtain needed community support for their bicycle safety efforts.
- At Hatherly School in Scituate, two teachers pioneered a bicycle safety program for children in grades K-5. The program has been conducted for the past 12-13 years and

includes an assembly and written and on-bike riding tests for obtaining a bicycle operator's license. Children also participate in recreational bike rides and safety club meetings during the school year. The teachers who developed the program attribute much of its success to the opportunities provided for ongoing contact with the children and continuous reinforcement of safe bicycling practices. The GHBS has provided financial support to the program.

- Bicycle safety education is also addressed in the *Comprehensive School Health Manual* distributed to all Commonwealth schools in 1995. Bicycle safety is identified as one of the issues of greatest concern for both primary and middle school children. MDPH also included bicycle safety and the importance of helmets in the *Health and Safety Child Care Manual* distributed to child care providers in the state.
- Finally, there is a movement to increase the availability of bicyclist training and safety education to adults as well as children. In 1996 the League of American Bicyclists (LAB) sponsored the training and certification of 16 Effective Bicycling Instructors. Two Effective Bicycling classes were also taught. Recently the Bicycle Coalition of Massachusetts approved the promotion and marketing of Effective Bicycling classes in the Commonwealth.

Certainly there are other bicyclist safety education programs and activities underway in the Commonwealth. No claims are made that this is a comprehensive listing. However, it does provide a useful overview of the range of available resources and interests.

Bicyclist Law Enforcement

There has generally been less activity in the area of bicyclist law enforcement. However, at least

three safety-related activities are especially noteworthy:

- With financial support from GHBS and MDPH, the Newton Police Department developed a video to encourage law enforcement officers to enforce the bicycle helmet law.
- The Cambridge Police Department has begun a training program for police officers on bicycle traffic enforcement for safety, using LAB's "The Law Is for All" video. They have also begun ticketing bicyclists for traffic violations at Harvard Square and at Central Square.
- The Lexington Bicycle Safety Program has worked with the Lexington Police Department to implement a "Smart Biker Citation" program. In this program police officers stop and cite bicyclists of all ages for "doing things right" while riding. The "citations" contain coupons for free food items donated by local businesses. The Lexington Bicycle Safety Program is currently seeking funds to produce a manual that other police departments can follow to set up their own programs.

One person interviewed noted that a recently passed Massachusetts law (MGL Ch. 85 Sec. 11C) may actually make it more difficult for police officers to enforce traffic laws for bicyclists. The law requires a minimum \$20 fine for all bicycle offenses and requires that citations be issued using a form which many departments do not routinely make available.

Although not a bicyclist law enforcement activity *per se*, a growing number of communities in the Commonwealth are utilizing police bicycle patrols. These patrols are also being used on some of the state's many off-road facilities, such as the Norwottuck and Cape Cod Rail-Trails. The patrols can serve as a model for appropriate

bicyclist behavior and promote greater acceptance of bicyclists on the roadway.

Identified Safety Needs

Following is a listing of needs that were identified through our telephone interviews. They cover a range of issues and topics, but are all directed at improving the safety of bicycling in the Commonwealth. The needs are not prioritized, although some were cited more often than others. At the same time, it should be emphasized that not everyone interviewed would support each of the needs; this is simply a compilation of the ideas generated.

- More facilities, including both off-road paths and improved accommodation on existing roadways.
- Design guidelines and other tools for educating state and local transportation engineers and planners about how best to accommodate bicycling.
- Public information and education campaigns are needed to educate motorists and bicyclists about their rights and responsibilities as road users, persuade them to be more considerate of each other, and help them to better "share the road."
- Increased education and awareness should be accompanied by greater enforcement of the rules of the road for bicyclists and motorists alike. In this regard, there is a need to educate law enforcement authorities about the importance of bicycle law enforcement, appropriate laws to enforce, and effective enforcement techniques.
- Registration of bicycles through local and statewide systems
- More systematic and comprehensive bicycle safety education programs taught in the public schools.
- More systematic, widespread public education about the helmet law. It was pointed out that some people are still unaware of the law. Recent research has demonstrated that knowledge of helmet laws increases helmet ownership and use.
- Resources. More resources are needed to develop programs, produce materials, purchase helmets, expand existing programs, conduct evaluations, disseminate information, etc.
- Greater emphasis on helmet promotion among riders not covered by the law, particularly middle school and high school age children.
- More attention to educating parents about their children's bicycle safety needs.
- More attention to expanding existing programs that have been shown to work.
- More evaluations of programs, and more publication of results in journals that are respected sources of information for the medical and health community.
- A stable source of readily available, high quality materials for distribution and use at the local level.
- Better statewide and local accident data to help in identifying and prioritizing safety needs. Incorporation of GIS into bicycle safety planning and analysis.
- More communication links between GHBSB, Injury Control and Prevention, Department of Education, Department of Public Safety, and other "key players."

- Greater attention to providing education and training opportunities for children and adults outside of the school system.
- More emphasis on bicycle safety in general. Bicycle safety and accommodation can be a higher priority within appropriate agencies.

Tourism and Economic Benefits

Improving bicycling conditions can attract visitors as well as increase usage by residents. Bicycling offers several favorable aspects that are a natural match for tourism. Bicycling affords unobstructed sights, sounds and smells. The speed of bicycling allows visitors to experience all that a scenic location has to offer and still move efficiently from place to place.

The growing popularity of bicycle travel in scenic vacation spots in the United States and elsewhere has increased purchases of bicycles and related equipment.⁵⁸ The supported bicycle tour is becoming a popular vacation alternative for the traveler who wants to enjoy all the benefits that bicycling has to offer. Such tours, which vary in their level of difficulty and the degree of their amenities, generally feature overnight accommodations, meals, luggage support vehicles, and guided tours of sites. Expanding this segment of the tourism market could greatly increase related revenues in the many scenic areas of Massachusetts.

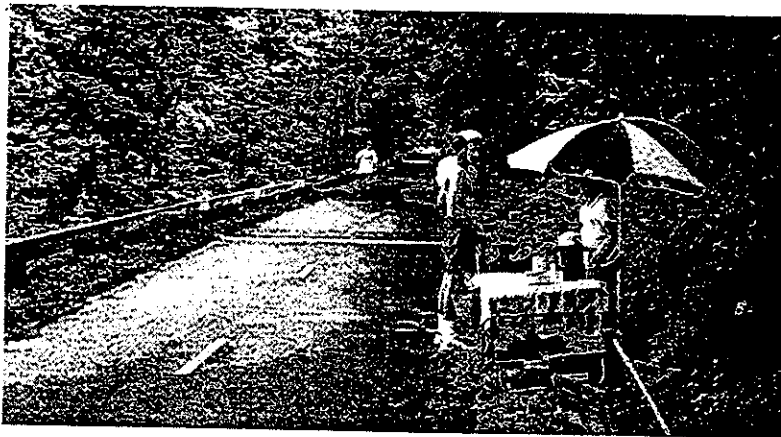
The economic benefits of bicycle travel have been measured in studies conducted in Massachusetts and in other states. A study of the bicycle touring industry in Vermont found that the approximately 40,000 out-of-state bicycle tour-

ists who visit Vermont annually bring in as much as \$17.5 million during Vermont's six-month bicycling season, spent on lodging, food, bicycle service and equipment, and other expenses.⁵⁹ The Oregon Department of Transportation conducted a survey of users of the 368-mile Oregon Coast Bike Route, and reported that the 5,000 to 6,000 bicyclists using the route per year spend between \$1.5 and \$2 million in the state annually. The average bicyclist spent \$30 per day and a total of \$200 in the state while on tour. Approximately 90 percent of the bicyclists surveyed were from out of state, and 96 percent of those bicyclists came to Oregon specifically to ride the Oregon Coast Bike Route.⁶⁰ Users of the Northern Central Rail Trail (NCRT), a 20-mile trail between Ashland, MD, and the Pennsylvania border, generate a substantial amount of economic activity. According to a study of the economic impacts of the NCRT, the sale of almost \$3.4 million in goods by businesses in Maryland in 1993 was directly attributable to the trail, on such items as bicycles, clothing, food and drink, and other goods.⁶¹ The NCRT was responsible for the creation and/or support of over 260 jobs in the state, and over \$171,000 in state sales tax revenue.

⁵⁹ Bruce Burgess, Bicycle Holidays, Middlebury, VT, in a presentation at Conference Velo Mondiale, Montreal, Quebec, September, 1992.

⁶⁰ Oregon Department of Transportation, survey of Oregon Coast Bike Route riders, 1990.

⁶¹ PKF Consulting. Analysis of Economic Impacts of the Northern Central Rail Trail. Prepared for Maryland Department of Natural Resources, May 1994.



Trailside businesses along the Minuteman Bikeway

In Massachusetts the economic benefits of bicycle-related travel are evident in business development along rail trails. A survey conducted of 38 businesses along the Cape Cod Rail Trail revealed that 60 percent of the businesses surveyed had expanded since opening, and cited the rail trail as a prominent factor in their deci-

sion to expand. Fifty-three percent said that revenues from rail trail users constituted 10 percent or more of their total annual revenues, and 75 percent said that proximity to the rail trail would make it easier for them to sell their goods and services in the years ahead.⁶² The businesses surveyed were restaurants, snack shops, campgrounds, bicycle shops, and others.

The bicycle travel market in Massachusetts is being increasingly accessed. Bicycle travel companies provide organized tours in scenic areas of the Commonwealth such as the Berkshires, Cape Cod and the Islands.

The Massachusetts Office of Travel and Tourism's (MOTT) current domestic marketing program is focused on attracting visitors from the New England and Mid-Atlantic states, which are the primary sources of domestic travelers to Massachusetts. The primary targets for their campaign are metropolitan areas within a one-day drive of Massachusetts.

MOTT Bicycling-related Promotions and Materials

MOTT produces the *Massachusetts Getaway Guide*, a 100-page magazine that provides information on tourist attractions in the Commonwealth, lodging, travel within Massachusetts, and city and state maps. The guide can be obtained through numerous out-

⁶² Gloria Stone, Intern at Department of Environmental Management. *The Cape Cod Rail Trail and the Local Business Environment: Part I of the Cape Cod Rail Trail Comprehensive Economic Impact Study*, 1995.

lets.⁶³ A section of the *Getaway Guide*, the Outdoor Guide, describes the Commonwealth's outdoor and natural attractions, such as beaches, hiking trails, and state forests and parks. Two pages of the Outdoor Guide, entitled "Bicycle Rail Trails," have maps of the Minuteman Commuter Bikeway and the Norwottuck and Cape Cod rail trails, along with information on the length of the trails, nearby bicycle shops, tourist attractions near the trail and contacts for additional trail information. MOTT has also recently printed *The Massachusetts Bicycle Guide* featuring off-road facilities and other information on bicycling in the Commonwealth.

Bicycling-Related Materials from Regional Tourist Councils

Several of the 13 RTCs in Massachusetts provide materials on bicycling in the RTC's region. They provide maps of popular routes or facilities in the area, and often include other information, such as bicycling safety tips or points of interest along the routes.

The Worcester County Convention and Visitors Bureau provides a fold-out map titled "Bike Routes of Northern Worcester County" with its visitor information packet. The map includes six individual scenic bicycle routes from 11 to 40 miles in length, information on points of interest along the routes, and a diagram that shows the location of the routes in relation to each other. The map is small enough to fit easily into a bicycling jersey pocket.

The Nantucket Island Chamber of Commerce includes with its information packet a map of off- and on-road bicycling facilities on the island, published by Young's Bicycle Shop. The

map shows pavement quality of the on-road facilities, a color-coded map of off-road paths, points of interest in town, and rules for bicyclists on and off the road.

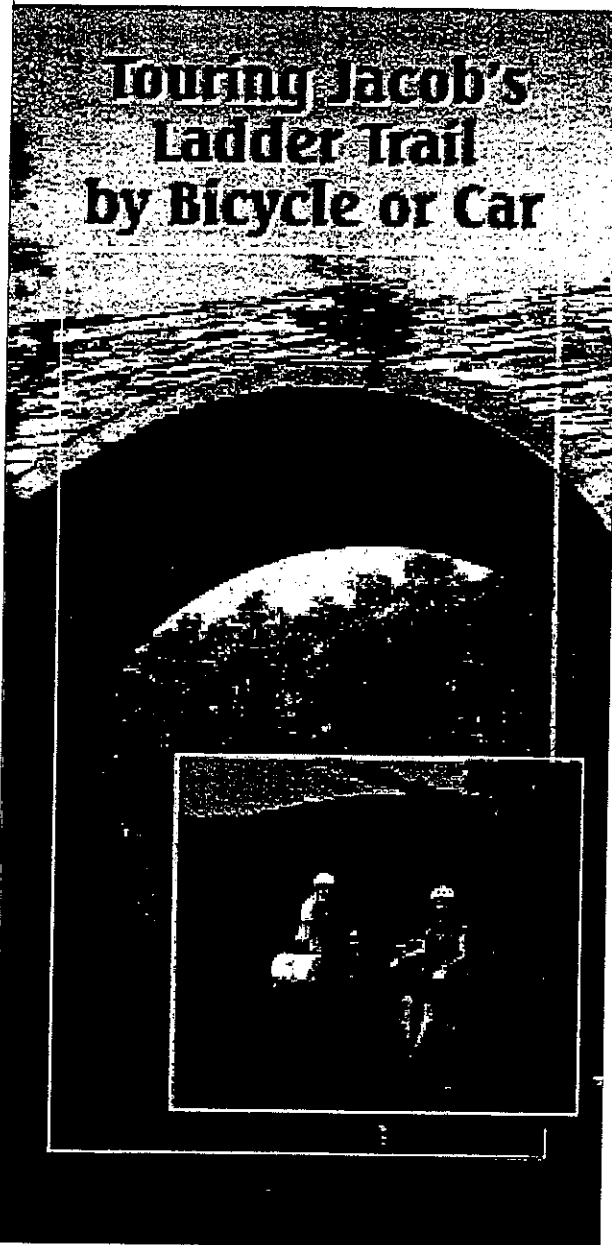
A map of the Minuteman Commuter Bikeway is included with visitor information provided by the Greater Merrimack Convention and Visitors Bureau. The brochure is published by the Friends of the Minuteman Bikeway, and has information on historic sites in the three Minuteman towns of Arlington, Lexington and Bedford; "Safety Signs and Common Courtesy" rules for all users of the Minuteman; and a map of the bikeway.

The Cape Cod Chamber of Commerce brochure, "Bikeways on Cape Cod," describes and has maps of bicycling trails on the Cape, such as the 25-mile Cape Cod Rail Trail from South Dennis to Eastham; the Boston to Cape Cod Bikeway, a 70-mile route on roads from Provincetown to Boston; three unpaved trails on Cape Cod National Seashore land, and other trails.

A brochure entitled "Better Bicycling in the Pioneer Valley," showing six scenic bicycle rides, ranging in length from five to 30 miles, is included in information from the Franklin County Chamber of Commerce. The brochure includes maps and directions for each ride, along with safety tips for bicyclists, such as how to cross railroad tracks and turning safely in a sand patch. It is produced by the Pioneer Valley Association.

⁶³ MOTT's toll-free telephone number for obtaining the *Getaway Guide* is 1-800-447-MASS, ext. 500; e-mail address is vacationinfo@state.ma.us.

Bicycle Program Examples



■ **Touring Jacob's Ladder Trail by Bicycle or Car, a guidebook prepared by the Pioneer Valley Planning Commission**

Opportunities and Needs

Bicycle travel has been shown to be a source of substantial revenue in several states. The industry is in the developing stages in Massachusetts, and there are a few companies in the state which are realizing part of the business potential of bicycling. Other businesses outside the state are also involved in bicycle tourism in Massachusetts.

State tourism promotion offices in other states have developed materials, programs and organizations for marketing bicycling attractions. Other states have also developed non-profit organizations, sponsored by businesses and others, which promote bicycling and tourism in the state. MOTT can play an expanded role in increasing the visibility of Massachusetts as a bicycle travel destination and in capturing the revenue that it offers. These promotional efforts could attract funding from bicycle shops, tour operators, lodging, and other businesses which stand to gain from more bicyclists coming to Massachusetts.

Land Use and Zoning

The relationship between land use and zoning, and bicycle use is important because land use patterns influence transportation choices. As Baltes observed in his study of factors influencing nondiscretionary work trips by bicycle, "levels of bicycling vary greatly from metropolitan area to metropolitan area. MSAs (Metropolitan Statistical Areas) with relatively high levels of nondiscretionary bicycling seem to have urban densities that promote shorter trips. . ."⁶⁴.

⁶⁴ Michael R. Baltes, "Factors Influencing Nondiscretionary Work Trips by Bicycle Determined from 1990 U.S. Census Metropolitan Statistical Area Data," in *Transportation Research Board No. 1538 Safety and Human Perform-*

Given the strong tradition and institutionalization of "home rule" in Massachusetts, land use planning and zoning have great potential to effectively create many of the bicycle facilities and system elements needed to complete regional and statewide plans. The most important principle is that bicycling is integrated into land use and transportation planning, infrastructure development and maintenance.

Bicycle facilities planning in Massachusetts can be influenced by statewide regulations and municipal land use controls (including zoning bylaws and related regulations) in a number of ways. Regulatory measures which fall into these categories have the potential for becoming effective mechanisms by which to improve conditions for bicycling in the Commonwealth. With this purpose in mind, this section examines three general categories of regulatory activities: (1) municipal master plans, (2) open space and recreation plans, and (3) zoning and other land use control techniques. It should be noted, however, that in jurisdictions with professional planning staff it is not always necessary to make extensive use of formal documents and controls. For example, in Cambridge general goals have been set through the Vehicle Trip Reduction Ordinance and the Growth Policy Document and implemented through integration with ongoing transportation and community planning.

Master Plans

The effectiveness of land use planning as an approach to promote bicycle use rests partly on how much a municipality is willing to focus on increased bicycle use as a stated community goal. The most direct way for a community to address such a goal is to clearly state it in the context of a master plan, comprehensive plan, or

growth management plan. Alternatively, if the municipality does not have such a plan, a similar result can be accomplished by incorporating directly into its existing zoning bylaws a variety of bylaw adjustments, design guidelines and other regulatory mechanisms which relate to bicycle use. In either instance, the primary goal is to codify the community's stated intention to promote bicycle use in language which has practical implications for land use and development decisions, and which carries the legal power conferred by the zoning ordinance.

A reasonably current master plan generally provides a municipality with ample opportunity to state policies aimed at bicycle use, and, more importantly, to convert those policies into law on the floor of town meeting. Indeed, it is useful to ensure that local bicycle guidelines are clearly stated in master plans - plans which are grounded in an open public process - in such a way that their impacts on development decisions are clearly understood and which anticipate some of the practical implementation issues. The goal is to inform project proponents, at the earliest possible point, of the importance of bicycle facilities in the local land use decisions and to build in practical incentives that foster creative compliance by the private sector.

Planning agencies and boards might broadly state the bicycle elements of these master plans, outlining the general desire of the municipality to encourage bicycle use. They might also be much more specific, including, for example, an entire chapter of the plan presenting the municipality's bicycle strategy. This might include such items as maps showing how bicycle facilities can be incorporated into future development and specific locations for bicycle racks, lockers, or other bicycle parking facilities.

nance, *Pedestrian and Bicycle Research*, Washington, D.C.: National Academy Press, 1996.

An important function of municipal master plans is to provide a rational foundation for the municipality's power - enabled by state legislation- to exercise control over land use decisions by the private sector. In court challenges to local zoning bylaws, judges often refer to current local master plans to seek guidance which may affect the adjudication of specific zoning issues brought before the court. The stronger the rational basis for zoning decisions provided by the master plan, the more likely a judge is to uphold zoning provisions which derive from it.

There are other opportunities for a municipal master plan to express the community's desire to encourage bicycle use. One is the strategy of designating certain selected roadways in a community as "scenic roads."

In the process of designating a roadway as a scenic road, the municipality may state its intention to develop a bicycle facility on the roadway, or perhaps an off-road bicycle path. If the roadway is town-owned, this provides a valuable stated policy to guide the capital budgeting plans and focus the actions of the municipality's public works department. Of course, any improvement should maintain the scenic character of the roadway.

Another opportunity is through the development of coordinated local, regional and state bicycle plans. The RPAs have developed a bicycling component in their Long Range Transportation Plans. This planning activity allows for identification and prioritization of both on- and off-road bicycle improvements. As more communities establish bicycle committees or advisory boards, similar planning can be provided locally, and coordinated with regional and state efforts.

Some regions and communities include recommendations for promoting bicycle use in "growth policy plans." These plans are typically produced by communities undergoing significant growth and are intended to augment a community's master plan. In terms of transportation policy, these plans usually focus on lessening a community's dependence on the automobile. Recommendations can take the form of land use policies which promote bicycle use, and which in turn are supported by bicycle use. A supplemental approach is to coordinate bicycle planning efforts.

Open Space and Recreation Plans

Preparation of a community's Open Space and Recreation Plan presents another opportunity for improving bicycling conditions. While not required, many communities regularly prepare these plans for the purpose of guiding local decisions pertaining to the development of facilities such as bicycle paths. They also provide valuable input, through public participation, to reach planning and zoning decisions regarding open space to be protected. Such open space and recreation plans are required by the Massachusetts Division of Conservation Services if a community wishes to receive open space acquisition funds from the state. While a bicycle plan is not currently a required component of a community's Open Space and Recreation Plan, it may be useful, as all available mechanisms to promote bicycle use are identified, to assess the possibility of adding such a component to local plans.

Zoning Bylaws or Ordinances

For communities with or without master plans, bicycle use can be stimulated through local zoning by:

- Including them as required facilities within a particular zone, identical to the means by which parking and loading facilities are required;
- Identifying and specifying them in design guidelines;
- Considering them in the site plan review or approval process;
- Incorporating them explicitly into the subdivision regulation process; and
- Including them as an item for consideration in the special permit process.

Zoning Requirement

In a simple requirement situation, a zoning by-law (or zoning ordinance in the case of a city) could include a table showing how many bicycle parking spaces would be required per 1000 square feet of space (or other relevant measure, such as seats beds, or classrooms). These requirements would have to be met before an occupancy permit is granted by the building inspector.

Design Guidelines

Increasingly common among communities is the adoption of design standards to guide the quality and character of future development within particular zones or for certain development projects. Design guidelines can often be extremely detailed, sometimes including numerous pages of specifications describing such elements as sign materials, color, massing, lighting, and shapes. The importance of having design guidelines in the zoning process is that they

provide a mechanism by which the municipality may engage the developer in discussions to consider making adjustments to a project. Such discussions and negotiations may occur either when the developer (1) submits a site plan for review, (2) submits a subdivision proposal, or (3) requests a special permit.

To encourage bicycle use, design guidelines can provide opportunities for communities to shape the design of bicycle lanes, paths, bicycle racks, and other design elements. Example of bicycle path design are shown on Figure 4. They also can serve as a basis for securing general agreement on funding, through the municipal operating budget, to address important, and often critical, maintenance and public safety issues. In this respect, the guidelines serve as a useful management tool for a municipality's engineering department, and provide a framework within which developers may initiate proposals for submittal to the municipality for review and eventual approval.

Site Plan Review

At its most basic level, site plan review (not approval) can be required for any type of land use – usually over a certain size threshold – where the planning board wishes to review the details of a proposal. More and more communities have adopted site plan review for this purpose, simply because they are reluctant to allow larger scale projects to proceed without sufficient public discussion of details in the planning stage. By 1978, for example, 54 of the 101 cities and towns in the Metropolitan Area Planning Council (MAPC) region had adopted some sort of site plan review. More than 75 municipalities now have this provision. Those cities and towns which use this tool are located, for the most part, outside Route 128, where the historically ample

supply of open developable land has attracted larger developments, and where organized planning from a land use control standpoint lagged behind municipalities closer to Boston. Site plan review is also widely used in central and western Massachusetts, especially in the faster growing suburban towns near larger cities.

Subdivision Regulations

Subdivision regulations also present an opportunity for municipalities to encourage bicycle use. The regulations themselves could spell out specific requirements relating to the inclusion of bicycle facilities in a proposed subdivision and include design requirements, as is becoming common for drainage facilities. For example, a subdivision regulation could recommend or require that a proposed development

include such features as bike lanes, appropriate signs, and even bike racks as part of the development proposal. Or, the regulation could simply refer a proposed developer to the portion of the municipality's zoning bylaw that contains the appropriate design guidelines for bicycle facilities. Another alternative would be to instruct the developer to refer to the planning board's set of design guidelines, if the guidelines have not been formally adopted in the form of a bylaw. If the community does not have a preexisting set of detailed guidelines, the subdivision regulation could recommend or require that the developer follow their Regional Planning Agency's design guidelines for bicycle use. Finally, if these do not exist, the subdivision regulation could recommend or require that developer demonstrate reasonable compliance with MassHighway's "Building Better Bicycling," or "Guide for the Development of Bicycle Facilities," prepared by the American Association of

State Highway and Transportation Officials (AASHTO).

Special Permits

In the case of a special permit, project proponents can actually be required to provide the desired bicycle facilities. Once again, however, it is useful to have guidelines previously issued, published and understood by all, that inform the project proponent at the earliest possible point that bicycle facilities are desirable and will, in all likelihood, be required. In all cases, the logic of requiring the facilities should be made evident. That logic would be considerably enhanced by the existence of a Master Plan or Comprehensive Plan for the entire city or town that specified the provision and location of bikeways in the vicinity of the proposed project.

Site plan *approval* takes place as part of a special permit-granting process. Usually this occurs when an unusually large project is proposed. Examples are cluster housing, office parks, industrial parks, planned unit development, and shopping malls. Site plan approvals, which include and are based upon a site plan review process, occur to satisfy the requirements of a special permit, which is issued upon approval of all elements. This level of requirement is clearly more stringent than that involved in site plan review. For instance, referring once again to the MAPC region, by 1978, 30 of MAPC's 101 cities and town allowed residential cluster development, and only 13 cities and towns allowed planned unit development, with both types of development requiring a special permit. Almost all cities and towns in the Commonwealth currently subject large industrial, commercial, institutional, and recreational projects to the special permit-granting process. Some require environmental reviews, including traffic, before they

will grant a special permit. In the discussions which surround the consideration of a special permit, bicycle facilities are sometimes put forth as mitigation measures, especially when large or unacceptable automobile traffic impacts are expected. Finally, it may also be appropriate under some circumstances to include bicycle facilities as a required element of development irrespective of potential traffic impacts.

Environmental Reviews

In all environmental reviews, there is an opportunity to determine the benefits bicycle facilities might provide. This opportunity can be exercised at various stages in the environmental review process. Environmental reviews are very common. They are required for federally funded projects under the National Environmental Policy Act (NEPA). In Massachusetts, environmental review is required for all projects over a certain size under the provision of the Massachusetts Environmental Policy Act (MEPA). Many cities and towns have also enacted environmental review requirements under zoning provisions, or in some cases under separate acts.

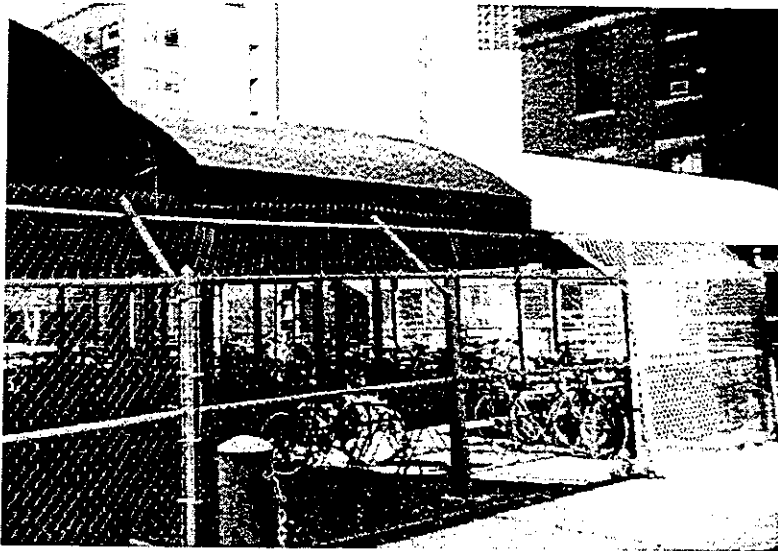
Both the NEPA and MEPA processes provide for an initial assessment to determine if a full environmental impact statement (NEPA) or report (MEPA) will be required. Documents that list and estimate magnitudes of environmental impacts are prepared by project proponents and submitted for review. A 30 day public review period of these documents offers one opportunity to introduce bicycle considerations into a project. If an official finding that a full environmental impact statement or report is necessary, the scoping process that must precede and guide preparation of that report offers a second opportunity to introduce bicycle considerations. A third opportunity is offered in the public par-

ticipation process that is required for preparation of the draft environmental impact statement or report. A fourth opportunity exists in the selection of mitigation measures to reduce or eliminate unwanted impacts. These must be identified in the draft environmental impact statement or report. Finally, a fifth opportunity is presented by the public review period required at the completion of the draft statement or report. Both written and oral comments are received in the draft statement or report review process, and they must be contained in the final statement or report. There is actually a sixth opportunity presented if the NEPA or MEPA officials can be convinced that a supplementary environmental impact statement or report should be undertaken to address the weaknesses agreed to in the draft and final statement or report.

Processes for environmental review required by some cities and towns are generally not as structured or involved as those specified by NEPA and MEPA. However, they can be quite effective in negotiating impact mitigation. Moreover, cities and towns formally participate in the NEPA and MEPA processes, via the requirements to notify them, thus inviting their participation in the entire federal and state processes. Regional planning agencies also have review responsibilities under MEPA. Environmental impact review is clearly a very widespread and established practice.

Opportunities to address bicycle transportation in the development review process include:

- Existing bicycle facilities in the vicinity of the development site should be identified.



Bicycle Parking at Massachusetts General Hospital in Boston (top) and valet bicycle parking at Redbones Restaurant in Somerville (bottom)

Bicycle Facilities at Existing Developments

It is possible to propose legislation that would require all appropriate existing developments, such as office parks and shopping centers, to be "retrofitted" with bicycle system facilities, such as racks, lockers, showers and clothes changing rooms. Appropriate legislation has been enacted at the federal level requiring buildings, roads and walkways, public transportation facilities and other facilities to be adapted to accommodate people with physical disabilities.

It is unlikely that retrofitting private developments can be done under zoning, given the general principle that zoning is not retroactive. Zoning applies to new development. Pre-existing development that does not conform to zoning provisions is classified as "non-conforming" and is allowed to continue, and even change, providing changes do not make it more non-conforming. It would require separate non-zoning legislation to require that existing development be retrofitted with bicycle facilities.

It would require separate non-zoning legislation to require that existing development be retrofitted with bicycle facilities.

A more practical approach to getting bicycle facilities included in existing developments is to rely on volunteer and cooperative efforts within the private sector, and administrative regulations in the public sector. There are many instances of volunteer cooperative private groups that act together through business partnerships and other forms of organization to accomplish

- Bicycle trips should be counted as part of peak hour weekday and, if required, Saturday traffic volume counts
- Future bicycle use should be estimated in projects where the share of bicycles is expected to be significant.
- Bicycle improvements should be considered as potential mitigation measures to reduce the number of project-generated vehicle trips.
- Roadway mitigation measures that would negatively affect bicycle travel should be avoided and minimized.

common objectives. Downtown revitalization partnerships and transportation management organizations are two increasingly popular examples. Chambers of commerce, which are very widespread, are another. These examples are cited because they have the potential to influence private sector improvements where they are important for increased bicycle use, e.g., in business areas for shopping, commuting and other trips. It is likely that business associations, who regularly raise money and pay dues, can be convinced of the general (social) and specific (individual or personal) benefits of creating more incentives for bicycle use in their area, and on their property. This is especially so in view of the fact that the more basic but effective installations that can be made are inexpensive bicycle racks.

Public sector property retrofitting to facilitate bicycling can best be done by administratively requiring that existing public properties be improved to include bicycle facilities. It is logical for public projects to be included in any overall efforts to retrofit existing developments with bicycle facilities. This requires funding to make the improvements. It requires action at the municipal, regional, state and federal levels. These actions should be initially targeted at facilities that have the largest work forces, but smaller facilities should not be overlooked. Public facilities can lead the way, demonstrating to the private sector that inclusion of bicycle features can induce some commuters to use bicycles. State and federal facilities are generally larger than municipal facilities, so attention should focus on them first. To overcome arguments that bicycle features are ineffective and wasteful it would be prudent to have their initial installation at facilities large enough to show convincing results in terms of inducing bicycle use. Increased use will require not only the physical facilities, but also some sort of information pro-

gram promoting the use of bicycles for commuting and other transportation purposes.

As one example, MASCO, a Transportation Management Association (TMA), has successfully used Transportation Demand Management (TDM) funds to promote bicycle commuting in the Longwood Medical Area of Boston.

Recommended Actions

5

This chapter contains the recommended actions of the Statewide Bicycle Transportation Plan. These recommended actions are organized by program area, generally following the sections in the previous chapter: Opportunities and Needs.

The recommended actions are presented in a three-column format with an opportunity/need and proposed agency listed for each series of recommended actions.

These recommended actions recognize that many groups, organizations, and agencies shape bicycling conditions. They plan, fund, design, construct and maintain bikeways, shape land use and development patterns, promote bicycling, educate bicyclists and motorists, provide technical assistance and training, and enforce the rules of the road. These activities are carried out at the state, regional and local levels.

Building and Maintaining Bicycle Facilities

Cities and Towns

Cities and towns initiate most projects that serve bicyclists. The state funds municipal roadway and other capital projects through Chapter 90, which distributes funds from the State Transportation Bond. The state also provides maintenance, snow removal, and policing funds through Chapter 81. Cities and towns can use this money to build bicycle facilities on and off roads, upgrade existing paths, and maintain facilities. It is up to the municipality to prioritize the use of this funding.

Municipal public works and traffic departments construct and maintain most roadways. They upgrade roadways and operate traffic signals. Subdivision streets are sometimes accepted by the municipality as public ways and publicly maintained.

Municipalities may also access federal funds, Greenways and Trails Grants, Urban/Self Help funds, Downtown Partnership Program funds, Community Development Block Grant (CDBG), and other funding programs to build and improve local sidewalks, bikeways, and streetscapes. In most cases municipalities pay for projects through a combination of funding sources (summarized in Appendix D).

Regional Organizations

The 13 Massachusetts RPAs represent the cities and towns in their regions and develop regional transportation plans. A Metropolitan Planning Organization (MPO) differs from an RPA in that it includes representation from a number of transportation agencies and has specific responsibilities under the federal transportation funding system. RPA membership is shown in Appendix B.

RPAs and MPOs play a primary role in prioritizing projects and coordinating state and federal funds for municipal projects. Through the Transportation Improvement Program (the TIP process), MPOs develop a list of projects for funding for a six-year horizon. This process includes all highway and transit projects, many of which include a bicycling component, as well as other federally funded projects. Each region works closely with BTP&D to direct funding to projects. BTP&D compiles all regional TIPs and publishes a State TIP (the STIP).

State Agencies

MassHighway is responsible for the design, construction, and maintenance of many state-owned roads. MassHighway will often build bicycle facilities along segments of state highways if the

municipality agrees to assume responsibility for maintenance. MassHighway also designs roadways and bridges to accommodate bicycle use.

The Department of Environmental Management (DEM) and the Metropolitan District Commission (MDC) also build and maintain extensive roadway and path systems on property that they manage. In addition, DEM also provides small grants through the Greenways and Trails Demonstration Grants Program to local non-profit organizations, municipalities, and RPAs.

Cities and towns may qualify for other types of funding from the state, such as Transportation Enhancement grants funded through MassHighway, and Community Development Block Grants (administered by the federal Department of Housing and Urban Development). The Executive Office of Environmental Affairs (EOEA) Division of Conservation Services administers Self Help and Urban Self Help programs to acquire and improve open space, including trails.

Land Use Planning Roles that Affect Bicycling

Cities and towns play the principal role in shaping land use and development patterns through zoning and subdivision regulations. Density controls, building setback requirements, parking requirements, site plan review requirements, and provisions for mixing or segregating land uses all affect bicycling conditions.

At the state level, the EOEA's MEPA Unit reviews development projects for environmental impacts. The Massachusetts Environmental Policy Act (MEPA) requires that the proponents of projects that meet certain thresholds (square footage, traffic generation, parking spaces, and other criteria) must analyze the potential im-

pacts of their projects. Bicycle access is a component of all transportation considerations, and there are opportunities for more specific treat-

ments of bicycle access to and within new development.

LIST OF ACRONYMS USED IN RECOMMENDED ACTIONS SECTION

AASHTO.....	American Association of State Highway and Transportation Officials
CTSP.....	Community Traffic Safety Program
DEM.....	Department of Environmental Management
DOE.....	MA Department of Education
DHCD.....	MA Department of Housing and Community Development
EOEA.....	MA Executive Office of Environmental Affairs
EOTC.....	MA Executive Office of Transportation and Construction
GHSB.....	MA Governor's Highway Safety Bureau
GIS.....	Geographic Information System
GSA.....	General Services Administration
HMO.....	Health Maintenance Organization
MassHighway.....	Massachusetts Highway Department
Massport.....	Massachusetts Port Authority
MBAB.....	Massachusetts Bicycle Advisory Board
MBSA.....	Massachusetts Bicycle Safety Alliance
MBTA.....	Massachusetts Bay Transportation Authority
MDC.....	Metropolitan District Commission
MDPH.....	Massachusetts Department of Public Health
MGL.....	Massachusetts General Laws
MOTT.....	Massachusetts Office of Travel and Tourism
MPO.....	Metropolitan Planning Organization
MUTCD.....	Manual of Uniform Traffic Control Devices
MWRA.....	Massachusetts Water Resources Authority
PSA.....	Public Service Announcement
PTA/O.....	Parent Teacher Association/Organization
RMV.....	Registry of Motor Vehicles
RPA.....	Regional Planning Agency
RTA.....	Regional Transit Authority
RTC.....	Regional Tourist Council
TDM.....	Transportation Demand Management
TMA.....	Transportation Management Association

RECOMMENDED ACTIONS

Program Area: Implementation

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. The Statewide Bicycle Transportation Plan is part of the evolving process to provide better bicycling conditions locally, regionally and statewide in Massachusetts. Implementation of this plan will build upon efforts to date in improving bicycling conditions.</p>	<p>1a. Address and recommend implementation measures through the Massachusetts Bicycle Advisory Board. The Board, which has a legislative charge to "advise the departments on matters relative to bicycle transportation," can, with public and agency input, recommend implementation measures.</p> <p>1b. Continue to provide state-of-the-practice information to state, regional and local agencies. Continue to incorporate current bicycle material in the MassHighway Design Manual as appropriate. Update the MassHighway publication "Building Better Bicycling: A Manual for Improving Community Bicycling Conditions." As the Bicycle Plan process has indicated, the RPAs, Commonwealth communities and others seek current technical information on: AASHTO and MassHighway bicycle facility design guidance; applicable MUTCD material; methodologies for assessing bicycle demand and usage; methodologies for evaluating roadways and paths; other measures to promote bicycle use, such as mapping and parking; initiating and funding bicycle projects; regional and local bicycle transportation plans and advisory committees; listings of resources; and other practical topics.</p> <p>1c. Coordinate Bicycle Plan implementation with Pedestrian Plan implementation, and with other initiatives as applicable.</p>	<p>DEM, MassHighway</p> <p>MassHighway, BayState Roads Program</p> <p>Affected agencies</p>

RECOMMENDED ACTIONS

Program Area: Assessing Bicycle Accommodation on Roadways

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
1. The existing roadway system is central to establishing a comprehensive network of bicycle facilities. A methodology to evaluate the accommodation of bicycles on existing roadways is a useful step in identifying opportunities to improve bicycle travel. Traffic flow and roadway cross section characteristics are key indicators of how well a roadway accommodates bicycles. A comprehensive data collection program coupled with a Geographic Information System (GIS) are useful in applying the methodology developed as part of this plan.	<p>1a. Identify traffic flow, roadway cross section, and other characteristics that affect bicycle travel within existing roadway corridors.</p> <p>1b. Identify other agencies that use these traffic and roadway data for planning and engineering applications.</p> <p>1c. Institute data collection and management activities to meet the needs of the methodology developed as part of this Plan.</p> <p>1d. Compile existing data in database format (inventory file) that meets the needs of all involved agencies.</p> <p>1e. Tie this database to the Commonwealth's existing Geographic Information System (GIS).</p> <p>1f. Institute a long-term roadway data collection and management program that meets the bicycle program needs of state, regional and local agencies.</p>	<p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p>

RECOMMENDED ACTIONS

Program Area: Assessing Bicycle Accommodation on Roadways (continued)

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
2. It is important to identify roadways that do not currently accommodate bicycling and then evaluate treatments to better accommodate bicycle travel on these roadways. A methodology to rate bicycle accommodation on roadways is a useful step in identifying opportunities to improve bicycle travel.	<p>2a. Evaluate bicycle accommodation on roadways in travel corridors as part of the ongoing transportation planning process.</p> <p>2b. Identify roadway segments with lower bicycle accommodation ratings in corridors of existing and potential higher demand for bicycling.</p> <p>2c. Identify roadway improvements and other measures to address the needs identified in 2. Improve conditions for bicycling within these travel corridors, using state-of-the-practice design. Where built improvements are not feasible, explore and utilize other improvement options.</p> <p>2d. Prioritize projects and implement in conjunction with ongoing construction program.</p> <p>2e. Continue to monitor developments in the evolving field of assessing bicycle accommodation. Access federal, state and other research and apply as applicable to Massachusetts conditions. Conduct additional research as warranted. Provide technical transfer services to regions, localities and others with need to know.</p>	<p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p> <p>MassHighway, MDC, RPAs/MPOs, cities and towns</p>

RECOMMENDED ACTIONS

Program Area: Bicycle Path Development

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. This plan provides a basic overview of the status of bicycle path development in Massachusetts and explores potential opportunities for developing a more extensive network of publicly owned bicycle paths across the state.</p>	<p>In order to have a full understanding of potential trail corridors available in the Massachusetts, two courses of action are recommended.</p> <p>1a. The Commonwealth of Massachusetts should continue to conduct a complete statewide assessment of former rail and other potential corridors. This study would consist of a detailed inventory, including map, of former rail corridors and, subject to owner consent, thorough physical examination to assess the integrity of each corridor (e.g., does the corridor remain intact or has development encroached on the corridor). Assessments previously conducted by EOTC, DEM, CTPS and the RPAs, and others would be incorporated. The statewide inventory should also address corridor ownership. A more extensive picture of the potential resources available for development of bicycle paths is the end result. The information that a statewide corridor assessment will provide can help determine where important missing links in a statewide network of bicycle paths exist and where the state may want to focus financial resources for development.</p> <p>1b. The Commonwealth of Massachusetts should prepare a State Trails Plan. This plan will include an evaluation of corridors within the state that can serve as paths including river, aqueduct, railroad, canal and utility rights-of-way. This plan is another resource that will identify potential bicycle paths.</p>	<p>MassHighway, RPAs/MPOs, DEM</p> <p>EOEA, DEM, MDC, MWRA, RPAs/MPOs, cities and towns</p>

RECOMMENDED ACTIONS

Program Area: Bicycle Path Development (continued)

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>2. Additional railroad corridors may become available for acquisition and development as bicycle paths.</p>	<p>2a. The Commonwealth of Massachusetts should continue to work to successfully obtain railroad corridors that are proposed for abandonment approval from the Surface Transportation Board (formerly known as the Interstate Commerce Commission), the federal agency that regulates Class 1 railroads. These efforts should reflect long range strategic plans as outlined in Section 1b.</p> <p>2b. Massachusetts General Law (Chapter 161C) passed in 1973 authorizes the Commonwealth to acquire active and former railroad corridors and requires that any railroad company intending to sell or dispose of a railroad corridor must offer said property to the Commonwealth on the same terms and conditions as may be reached with a private party. The Commonwealth should continue to act upon such offers when the corridor has the potential to become part of a statewide network of bicycle paths. Identify available financial resources to facilitate such purchases.</p>	<p>EOTC, DEM, RPAs, local government agencies, RTAs, MDC.</p> <p>EOTC, DEM, RPAs, local government agencies, RTAs, MDC.</p>

RECOMMENDED ACTIONS

Program Area: Bicycle Path Development (continued)

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>3. Massachusetts has in place an effective mechanism intended to preserve former railroad corridors that are not railbanked. Massachusetts General Law (Chapter 40, Section 54A) passed in 1975 provides that no local building permit can be issued for a structure to be built on land formerly used as a railroad right-of-way without a public hearing and permission of the Secretary of Transportation</p> <p>4. In order to take advantage of the opportunities available for rail-trail development, the issue of a trail delivery system needs to be addressed. Who will own these corridors, where will the funding for rail-trail development come from, who will build the trail and who will manage the facility? These questions need to be answered so that as railroad corridors become available, an organizational structure is in place to convert them into bicycle paths.</p>	<p>3. The Commonwealth should continue to apply this general law to preserve the physical integrity of former railroad corridors that have the potential to become part of a network of publicly owned bicycle paths.</p> <p>4. The Commonwealth of Massachusetts should develop and distribute guidelines that clearly identify state, regional and local roles in the development, operation and maintenance of bicycle path facilities.</p>	<p>EOTC</p> <p>EOTC, EOE</p>

RECOMMENDED ACTIONS

Program Area: Bicycle Facility Design

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. There is a need for uniform guidance in the design of bicycle facilities.</p> <p>2. There is a need to revise/clarify the definitions of bicycle facilities contained in the Massachusetts General Laws (MGL) to recognize shared use. The MGL defines a "bike path" as "a route for the exclusive use of bicycles separated by grade or other physical barrier from motor traffic". This definition does not recognize that these paths are used by pedestrians, people in wheelchairs, skaters, and others not on bicycles. Failure to recognize the shared-use character of these paths can lead to design and operational problems</p>	<p>1a. Continue to recognize the <i>Guide for the Development of Bicycle Facilities</i> (AASHTO, 1991) as "the primary design reference for designing bikeways". This document is in the process of being revised. When the new <i>Guide</i> is available, obtain copies and distribute to all town/city engineers and public works departments, as was done with the 1991 <i>Guide</i>.</p> <p>1b. Continue to incorporate bicycle facility design guidance into the MassHighway Design Manual</p> <p>2. Revise MGL Chapter 90E: Bikeways and other Chapters of the MGL where appropriate, as described below:</p> <ul style="list-style-type: none"> a. Incorporate in Chapter 90E the following definition from the AASHTO guide: <ul style="list-style-type: none"> • Bikeway - Any road, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes. b. Revised other definitions as needed to be consistent with expanded definition of a bikeway. c. Expand definition of "public way" to include shared-used paths and other bikeways that are not part of a roadway right-of-way. 	<p>MassHighway and other state and local agencies</p> <p>MassHighway</p> <p>Massachusetts General Court.</p>

RECOMMENDED ACTIONS

Program Area: Bicycle Facility Design (continued)

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>3. Actuated traffic signal systems in the Commonwealth should detect bicycles. When no motor vehicles are present at a leg of an intersection where a bicyclist is waiting, the traffic signal is not actuated. The bicyclist's choices are to wait for a motor vehicle to arrive to actuate the signal or to run the light.</p>	<p>3a. MassHighway and others should, as technology becomes available, develop and adopt standards for the detection of bicycles by actuated traffic signal systems.</p> <p>3b. Bicycle detection should be specified in new and retrofit projects involving actuated traffic signal systems, where needed, in accordance with the Manual on Uniform Traffic Control Devices.</p>	<p>MassHighway, MDC, cities, towns, and other appropriate agencies</p> <p>MassHighway, municipalities, and other agencies who own and operate traffic signals on public ways in the Commonwealth.</p>
<p>4. The AASHTO Guide notes that bridges can serve an important function by providing bicycle access across barriers. Some bridge features, however, may be unsuitable for bicyclists; these are, according to AASHTO, "open grated metal decks found on many movable spans" and "certain types of expansion joints that may cause bicycle steering difficulties."</p>	<p>4. Provide appropriate treatments to improve bicycle travel across bridges. Such treatments may initially include signs to alert bicyclists to surface conditions. Other longer term treatments may include: retrofitting existing bridges to improve surface conditions for bicycling; and bridge construction and reconstruction projects that incorporate surfaces more compatible with bicycle travel, specifically in bicycle travel paths, and provision of greater operating space.</p>	<p>MassHighway, MDC, local Departments of Public Works, and other agencies with bridge design/construction/maintenance responsibility.</p>

RECOMMENDED ACTIONS

Program Area: Construction and Maintenance Practices

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. Bicycles need to be accommodated in construction areas.</p> <p>2. Provide appropriate signing and striping during construction and as part of ongoing maintenance.</p> <p>3. The needs of all transportation modes, including bicyclists, should be accommodated in sweeping and drainage maintenance policies practices.</p> <p>4. Improved railroad crossings can better accommodate bicycles.</p> <p>5. Provide mechanisms for bicyclists to report roadway and path maintenance needs.</p>	<p>1a. Develop bicycle-oriented construction criteria</p> <p>2. Use wet skid-resistant pavement markings.</p> <p>3a. Continue current grate modification program to incorporate bicycle-safe grates. Ensure proper cleaning of catch basins to reduce the formation of standing water and surface irregularities.</p> <p>3b. Provide proper vertical and horizontal clearances. Trim vegetation to provide visibility of signs, sight lines, and lateral space adjacent to facilities.</p> <p>4. Encourage railroad and other personnel to consider bicycle use in design/maintenance of railroad crossings. Provide design guidance on railroad crossing treatments to accommodate bicycles.</p> <p>5. Establish a mechanism for reporting maintenance needs.</p>	<p>State agencies, utility companies, cities and towns, state and local police, bicycle organizations.</p> <p>MassHighway, MDC, other state agencies, cities, towns, and others involved in signing and striping.</p> <p>State, local, and other roadway/bicycle path maintenance agencies.</p> <p>State, local, and other roadway/bicycle path maintenance agencies.</p> <p>Railroads, state and local roadway agencies</p> <p>State and local roadway agencies and bicycle organizations.</p>

RECOMMENDED ACTIONS

Program Area: Transit and Multimodal Connections

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. There is an opportunity to increase both bicycle and transit use by improvements in three primary areas:</p> <ul style="list-style-type: none"> • bicycle access to transit stations and stops • bicycle parking at transit stations and stops and • conveyance of bicycles on transit vehicles <p>An increase in bicycling and transit use will advance broader goals of the Commonwealth, including improved air quality, personal mobility, and quality of life.</p> <p>There are also opportunities to improve bicycle linkage with other modes and modal centers. These modes include commuter ferries and other maritime services, and airports/airlines. Multimodal sites include park and ride lots, and existing and proposed multimodal centers, such as South Station in Boston.</p>	<p>1a. Assess primary roadways leading to transit stations and stops and other multimodal facilities, and where appropriate, improve roadways to better accommodate bicycles. Ensure that new roadways leading to transit stations and other multimodal facilities are designed to accommodate bicycles.</p> <p>1b. Ensure that all new bikeways and transit centers provide connections between these facilities. Improve connections between existing bikeways and transit/multimodal centers.</p> <p>1c. Provide/update inventories of bicycle parking facilities at all transit centers and major bus stops. Survey the numbers of bicycles parked at or near these facilities during peak periods of bicycle use. Assess the demand for bicycle parking at these facilities based on existing use data and an evaluation of potential demand.</p> <p>1d. Install additional bicycle parking facilities at transit centers and major bus stops based on demand. At transit centers such as commuter rail and subway stations, provide bicycle racks in secure and convenient locations. Bicycle lockers should be considered especially at locations that are not continuously populated. Large covered, secured bicycle parking facilities may be more appropriate where warranted.</p>	<p>RTAs and all agencies who own and maintain public roads that provide links to transit centers, Massport, and Mass Aeronautics</p> <p>RTAs and all agencies that construct, own, or maintain bikeways.</p> <p>RTAs, RPAs, cities and towns</p> <p>RTAs, RPAs, local police, cities and towns</p>

RECOMMENDED ACTIONS

Program Area: Transit and Multimodal Connections (continued)

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. There is an opportunity to increase bicycle use for transportation by improving bicycle parking at multimodal facilities. TDM and Enhancement funding may be applicable to such improvements.</p> <p>2. Increase security at multimodal sites.</p> <p>3. There is an opportunity to increase both bicycle and transit use by improvements in conveyance of bicycles on transit vehicles.</p>	<p>1e. Provide safe, secure, and adequate bicycle parking facilities at park-and-ride lots, airports, and other multimodal facilities.</p> <p>2. Increase monitoring of parking sites to reduce vandalism and theft. Locate parking facilities to increase surveillance.</p> <p>3a. Continue to increase the convenience of transporting bicycles on trains as was done on October 1, 1996, when the MBTA expanded the number of outlets for obtaining "Bikes on the T" permits and hours when bicycles are allowed on trains.</p> <p>3b. Encourage increased convenience of transporting bicycles on Amtrak trains and on private buses.</p> <p>4c. Facilitate transporting bicycles on ferries and other maritime services</p> <p>3d. Investigate potential adaptation of existing rolling stock and other equipment to better accommodate bicycle conveyance.</p> <p>3e. Assess bicycle/transit usage on a regular basis to determine how system improvements can be provided.</p>	<p>MassHighway, RTAs, RPAs, Massport, Massachusetts Turnpike Authority, and others</p> <p>RTAs, RPAs, local police, cities and towns</p> <p>MBTA</p> <p>AMTRAK and private bus companies</p> <p>Ferry and other maritime operators</p> <p>RTAs, other transit, and ferry operators</p> <p>Responsible agencies</p>

RECOMMENDED ACTIONS

Program Area: Bicyclist Education

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. A variety of curriculums and approaches are being used to educate children in the Commonwealth about bicycle safety and the importance of helmet use. They include school assemblies, videos, bicycle rodeos, public service announcements (PSAs), helmet promotion programs, and various safety materials such as posters and fliers. There is a need for a more consistent and comprehensive educational effort, reaching a greater number of children. There is also a need to educate teenage and adult bicyclists. These education efforts should focus on following the rules of the road when riding in traffic, being visible, and using appropriate safety equipment, including helmets.</p> <p>These efforts should also consult established programs such as Effective Cycling®* and those developed in Commonwealth communities.</p> <p>* Note: Effective Cycling® is a trademark of the League of American Bicyclists</p>	<p>1a. Implement a comprehensive, statewide school-based bicycle safety education program for children. A bicycle safety education program integrated into school health and/or physical education curriculums has the greatest potential for reaching all Massachusetts children. For maximum effectiveness, the program should include on-bicycle as well as classroom instruction. It would be part of a comprehensive traffic safety education program that would begin in the primary grades with school bus and pedestrian safety and progress through bicycle safety education for older elementary and middle school students to driver's education for teenagers.</p> <p>1b. Develop and evaluate a model program for adult bicyclist safety training and education. A variety of efforts will likely be needed to reach adult bicyclists. Possible approaches include distribution of safety materials at bicycle shops, "bicycle to work" and "family bicycle ride" events that also provide opportunities for education, inclusion of bicycle safety messages on local bicycle maps, articles or letters to local newspapers, involvement of local bicycle clubs, etc. Local law enforcement officers can also play a role in educating (and motivating) adult bicyclists. A bicyclist education campaign directed at adults would be tied to a larger motorist education and public awareness campaign, as well as to greater enforcement of traffic laws for bicyclists and motorists. Develop and evaluate the effectiveness of a model program at the local level for improving the skills and riding practices of adult bicyclists.</p>	<p>DOE, MDPH, GHBS Community Traffic Safety Programs (CTSPs), PTA/Os, local health departments and prevention centers, hospitals, Health Maintenance Organizations (HMOs), police departments.</p> <p>GHBS, CTSPs, PTAs, police departments, bicycle organizations, service organizations, others</p>

RECOMMENDED ACTIONS

Program Area: Motorist Education

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. There is a need to educate motorists in ways to effectively and safely share the road with bicyclists</p>	<p>1a. Develop a "Share the Road" campaign to increase motorist and bicyclist education. Such a campaign could be started at the state level and then extended to communities. PSAs, brochures, billboards and a variety of other media could be used to carry out the campaign. Media support would be needed, and use of incentives should be considered.</p> <p>1b. Educate motorists through the driver license process and driver training programs. Another method of reaching motorists is through information contained in driver's license manuals and through incorporating bicycle safety and "share-the-road" messages into statewide driver education training. Both the manual and the training should include questions relating to bicycling as well as more specific information on operating a motor vehicle on roadways where bicyclists are present. Reminders in the form of posters or brochures can also be placed in the information centers at RMV offices. Materials could be included with any mailings from the RMV.</p> <p>1c. Enforce traffic laws, targeting those which improve motorist/bicyclist interaction. Enforcement of traffic laws will lead to greater understanding of the laws by motorists and bicyclists.</p>	<p>MassHighway, GHBS, MBSA, RMV, public and private sector organizations</p> <p>GHBS, MBSA, RMV, public and private sector organizations</p> <p>Police departments</p>

RECOMMENDED ACTIONS

Program Area: Bicycle Helmet Use

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. Even though the Massachusetts bicycle helmet law for children ages 12 and under has had widespread positive impact, some parents and children remain unaware of the law, thus reducing its overall effectiveness in preventing deaths and reducing head injuries from bicycle crashes. There is a need for continued and expanded education for children as well as their parents about the state's bicycle helmet law. In addition, there is a need to continue to promote helmet use among bicyclists of all ages.</p>	<p>1a. Continue to promote public awareness and acceptance of the current statewide helmet use law. When the initial helmet law was passed, little funding was made available for promoting public awareness and acceptance of the law. Despite limited funds, GHSB, the Massachusetts Department of Public Health, and the Massachusetts Bicycle Safety Alliance have all led active campaigns to promote helmet use and make helmets more available and affordable to children. These efforts will need to be continued and even expanded in the future, as many children still are not wearing helmets. Educating parents about the importance of their child always wearing a helmet when bicycling should be a key component to the campaign. Pediatricians and other medical professionals can assist in the effort.</p> <p>1b. Promote helmet use among bicyclists of all ages. The majority of bicyclists injured and killed in traffic collisions are teenagers or adults, and helmets can protect these riders as well. Efforts to promote the voluntary use of helmets by bicyclists not currently covered by the statewide helmet law should be expanded. This might include, for example, developing posters and fliers that target adult riders, working with colleges and universities to promote helmet use among students as well as staff and faculty, and working with bicycle shops to make available a greater variety of low-cost helmets.</p>	<p>GHSB, MDPH, MBSA, DOE, and others.</p> <p>GHSB, MDPH, MBSA, DOE, and others.</p>

RECOMMENDED ACTIONS

Program Area: Enforcement

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. There is a need for enforcement of rules-of-the-road when bicycles and motor vehicles are operating on the same or intersecting roadways and other facilities. Bicycle enforcement pertains not only to the rules-of-the-road movements made by bicyclists, but also to the way motorists share the road with bicyclists. Helmet use by child bicyclists is another enforcement issue. The vast majority of bicycle law enforcement is done at the local level and requires commitment by community law enforcement officers. There is a need for educating law enforcement authorities, including State Police, about the need for bicycle law enforcement as well as the rights of bicyclists using roadways.</p>	<p>1a. Provide training to law enforcement officers. State and local law enforcement agencies should be encouraged to incorporate bicycle enforcement into their training and education programs. Programs should address the rights and responsibilities of both bicyclists and motorists as road users, along with effective approaches for bicycle law enforcement. Training videos such as the helmet video produced by the Newton Police Department (with GHSB funding) or the League of American Bicyclist's "The Law is for All" video can help to educate as well as motivate law enforcement officers.</p> <p>1b. Educate bicyclists about their responsibilities. Along with education, law enforcement can also play an important role in educating bicyclists about their responsibilities as road users. Bicyclists need to feel that it is important for them to obey traffic laws.</p> <p>1c. Review current status of Massachusetts General Laws pertaining to bicycling. If needed, recommend changes in the statutes. Develop information sheets that summarize and clarify the law for motorists and bicyclists as well as law enforcement officers.</p>	<p>GHSB, MDPH, State Police; local police departments and other agencies.</p> <p>GHSB, MDPH, State Police; local police departments and other agencies.</p> <p>GHSB, MDPH, State Police; local police departments and other agencies.</p>

RECOMMENDED ACTIONS

Program Area: Enforcement (continued)

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. There is a need for enforcement of rules-of-the-road when bicycles and motor vehicles are operating on the same or intersecting roadways and other facilities. Bicycle enforcement pertains not only to the rules-of-the-road movements made by bicyclists, but also to the way motorists share the road with bicyclists. Helmet use by child bicyclists is another enforcement issue. The vast majority of bicycle law enforcement is done at the local level and requires commitment by community law enforcement officers. There is a need for educating law enforcement authorities, including State Police, about the need for bicycle law enforcement as well as the rights of bicyclists using roadways.</p>	<p>1d. Promote police-on-bicycles programs. The concept of police-on-bicycles is growing in popularity in Massachusetts. More communities have established police bicycle units. The Massachusetts State Police have police officers on bicycles, as does every town on Cape Cod. Police-on-bicycles can be a very effective way to enforce rules-of-the-road for both bicyclists and motorists. They may also help to support community policing activities.</p> <p>1e. Involve local police whenever bicycle facility planning is being done within a community. Local officers tend to know where bicycle-motor vehicle crashes occur and the underlying conditions, and are thus in a position to make informed comments regarding facilities. Involving local police in bicycle facility planning can also help educate and motivate the officers concerning bicyclist needs and safety.</p>	<p>GHSB, MDPH, State Police; local police departments and planning agencies.</p> <p>GHSB, MDPH, State Police; local police departments and planning agencies.</p>

RECOMMENDED ACTIONS

Program Area: Use of Bicycle Accident and Injury Data

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. Bicycle injury and bicycle-motor vehicle accident data should be examined at both the state and local levels to identify needs and help guide countermeasure and program development. The data may also be used for program evaluation.</p>	<p>1a. Strengthen statewide reporting of bicycle-motor vehicle accidents. A uniform accident report form is used statewide. Although there is known underreporting of single vehicle bicycle accidents, this is true in every state. Make periodic contact with police agencies to maintain consistency of bicycle accident reporting.</p> <p>1b. Track bicycle-motor vehicle accidents. Provide MHD Bicycle-Pedestrian Program staff with annual summaries of bicycle accidents occurring in the state and examine the data to detect trends, new problems, and possible countermeasures. Apply the same process to certain local jurisdictions where there is considerable bicycling. Encourage local agencies to use accident typing techniques to further enrich the data.</p> <p>1c. Supplement accident data with hospital injury data. Highway departments generally rely on police-reported motor vehicle accident data for information on roadway safety. However, a majority of bicyclists' injuries result from falls or other non-collisions that do not involve a motor vehicle. To better understand the safety needs of these bicyclists, examine hospital discharge data and track them along with the statewide accident data. Hospital data can also be used to evaluate the effectiveness of state and local safety and helmet promotion activities.</p>	<p>State Police, local police, MDPH, RMV, and GHSB.</p> <p>State Police, local police, MDPH, RMV, and GHSB.</p> <p>MDPH, GHSB, State Police, local police, MDPH, and RMV.</p>

RECOMMENDED ACTIONS**Program Area:** Use of Bicycle Accident and Injury Data (continued)

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
1. Bicycle injury and bicycle-motor vehicle accident data should be examined at both the state and local levels to identify needs and help guide countermeasure and program development. The data may also be used for program evaluation.	1d. Implement GIS techniques as appropriate, to track bicycle accident locations and injury severity. 1e. Provide training related to accident reconstruction and typology.	State Police, local police, MDPH, RMV, and GHSB. State Police, local police, MDPH, RMV, and GHSB.

RECOMMENDED ACTIONS

Program Area: Bicyclist Safety: Communication and Networking

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. Currently many agencies are engaged in bicycle safety education and enforcement activities in Massachusetts. They include the Governor's Highway Safety Bureau, Massachusetts Department of Public Health / Injury Prevention and Control Program, the Bicycle Safety Alliance, and a variety of local agencies and programs. There is clearly a need to facilitate timely communication and sharing among these various groups, to benefit from each other's experiences and expertise as well as to pool resources and talents. The Bicycle Safety Alliance has fulfilled this role in the past, but additional resources may be needed to expand its activities.</p>	<p>1a. Update and widely disseminate the Bicycle Safety Resource Kit developed by MDPH. The update should include the latest information on key agencies, organizations, and individuals engaged in bicycle safety activities, and be made available "on-line" so that it can be easily modified and expanded.</p> <p>1b. Establish an on-line user group for quick and easy sharing of bicycle safety information. GHSB is developing a Web site that will include bicycle safety information. The user group might be modeled after the Bicycle Coalition of Massachusetts' on-line group, and used for (a) describing new programs, activities or materials, (b) announcing upcoming meetings, conferences, or other events of interest, (c) providing updates on pertinent legislation, (d) posing questions for others in the group to answer, (e) identifying funding opportunities, (f) seeking collaborators.</p> <p>1c. Host an annual bicycle safety conference to facilitate networking and sharing of ideas and programs.</p>	<p>GHSB, MDPH and MBSA</p> <p>GHSB, MDPH and MBSA</p> <p>GHSB, MDPH and MBSA</p>

RECOMMENDED ACTIONS

Program Area: Bicyclist Safety: Program Coordination and Leadership

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. There is no single focal point for bicycle safety education and enforcement activities in the state, nor an individual advocate at the state level responsible solely for bicycle safety. At both the Governor's Highway Safety Bureau (GHSB) and the Massachusetts Department of Public Health (MDPH), bicycle safety is one of many other program areas. There is a need for a more defined focus to the state's bicycle safety activities, with leadership that can provide longevity and continuity to its many bicycle safety programs.</p>	<p>1. Several approaches can be taken to improve overall program coordination and leadership. One approach is to expand the role already being played by the Massachusetts Bicycle Safety Alliance. The Alliance could be responsible for coordinating bicycle safety activities by the Governor's Highway Safety Bureau, Department of Public Health, and others, and would provide overall leadership, direction, and continuity to the program.</p>	<p>Massachusetts General Court, Governor's Office, GHSB, MDPH and MBSA</p>

RECOMMENDED ACTIONS

Program Area: Tourism

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. Bicycle tourism is a source of substantial revenue in several states. The industry is developing in Massachusetts, and there are a few companies which are realizing part of the business potential of bicycling. Other businesses outside the state are also involved in bicycle tourism in Massachusetts. Developing a stronger bicycle tourism business within the state would increase revenues realized by the Commonwealth.</p> <p>State tourism promotion offices in other states have developed materials, programs and organizations for marketing bicycling attractions throughout the state. Other states have also developed non-profit organizations, sponsored by businesses and other organizations, which promotes bicycling and tourism in the state. MOTT can play a prominent role in increasing the visibility of Massachusetts as a bicycle tourism destination and in capturing the revenue that it offers. These promotion efforts could attract funding from bicycle shops, tour operators, lodging, and other businesses which stand to gain from more bicycle tourists coming to Massachusetts.</p>	<p>1a. Continue to update, print and distribute State Bicycle Guide.</p> <p>1b. Develop a multipage brochure as a companion piece to the State Bicycle Guide that is oriented to the needs and interests of the bicycle tourist. The brochure could include information on lodging, bicycle attractions and tour operators in each region, and bicycling safety. It could also incorporate information already available from several regional tourist councils (RTCs) on bicycling and other outdoor activities in their region. Massachusetts geographically is a relatively small state, and different regions can be visited during the time period of a typical vacation. This publication could highlight the major bicycling attractions in the state, without requiring a vacationer to contact several separate RTCs for information.</p> <p>1c. Continue to feature bicycling in existing tourism promotions and publications.</p>	<p>MOTT, RTCs, the tourism industry, cities, towns, chambers of commerce, and others.</p> <p>MOTT, RTCs, the tourism industry, cities, towns, chambers of commerce, and others.</p> <p>MOTT, RTCs, the tourism industry, cities, towns, chambers of commerce, and others.</p>

RECOMMENDED ACTIONS

Program Area: Bicycle Promotion

OPPORTUNITY/NEED	RECOMMENDATION	PROPOSED AGENCIES
<p>1. Bicycling is a highly efficient means of transportation, has air quality benefits, and offers healthy, enjoyable activity for people of all ages. The National Bicycling and Walking Study has set a goal of doubling the percentage of trips made by bicycling and walking, at the same time reducing by 10 percent the number of bicyclists and pedestrians killed and injured in traffic crashes. To support this goal, Massachusetts will need to carry out its own statewide effort to make bicycling a more attractive transportation option for more of its people.</p>	<p>The promotion of bicycling entails a comprehensive program that addresses facility needs, safety education and law enforcement, as well as encouragement. The recommendations below relate to areas not already covered elsewhere.</p> <p>1a. Work with local communities, businesses, academic institutions or other agencies and organizations to sponsor and promote bicycle to work days, community bicycle rides, and other events to attract and encourage new bicyclists, such as "Bike Month".</p> <p>1b. Produce state, regional and local bicycle maps to help bicyclists identify suitable routes for bicycling to desired destinations.</p> <p>1c. Develop a statewide multi-media campaign promoting bicycling. This might be linked to other efforts, such as a "Share-the-Road" campaign.</p> <p>1d. Designate regional, and local agency bicycling contacts, and support the establishment of regional and local bicycle advisory committees.</p> <p>1e. Develop a Clean Air/Bike-to-Transit pilot program, emphasizing reduced cold starts. Evaluate and expand as appropriate.</p>	<p>DEP, DEM, RPAs/MPOs, other state agencies with transportation and air quality responsibilities, CARAVAN, TMAs, Smart Routes, RTAs, the BayState Roads Program, cities and towns.</p> <p>MOTT, MassHighway, RTCs, DEP, DEM, RPAs/MPOs, other state agencies with transportation and air quality responsibilities, CARAVAN, TMAs, Smart Routes, RTAs, the BayState Roads Program, cities and towns.</p> <p>DEP, DEM, RPAs/MPOs, other state agencies with transportation and air quality responsibilities, CARAVAN, TMAs, Smart Routes, RTAs, the BayState Roads Program, cities and towns.</p> <p>RPAs/MPOs, cities, and towns</p> <p>DEP, RTAs, RPAs/MPOs, TMAs, cities and towns.</p>

Appendix A

Public Participation

Acknowledgments

This plan was prepared for the Federal Highway Administration (FHWA), Executive Office of Transportation and Construction (EOTC), and the Massachusetts Highway Department (MassHighway). It was developed through a collaborative effort by the VHB consultant team, MassHighway and others.

Overall guidance and direction was provided by a Technical Advisory Committee. The committee was formed at the outset of the project and met regularly to review draft products, provide support, and contribute ideas for the plan. Members include an interdisciplinary team of representatives from MassHighway and other state agencies, as well as municipal, regional, and federal representatives, and a representative of the Massachusetts Bicycle Advisory Board.

Guidance was also provided by a User/Focus Group, consisting of representatives of bicycle organizations, manufacturers and retailers, as well as a transportation management association (TMA) representative, a municipal planner, local police officer, and an elected official, all of whom have an interest in bicycling.

A number of individuals, agencies, and organizations also contributed to the development of the plan through their participation at two rounds of seven public meetings held throughout the Commonwealth in June and November, 1996, and through written and electronic comments.

The project team appreciates and recognizes all of the individuals who contributed to the Massachusetts Statewide Bicycle Transportation Plan.

Consultant Team

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Fuss & O'Neill, Inc.
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John Allis	Belmont and Ace Wheelworks
Elizabeth Fritz Zane	Kryptonite Corporation
Dennis Geary	Newton Police Department
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Wayne Feiden	City of Northampton
Michael G. Hering	Bicyclist
Ted Hamann	Bicyclist

Individuals Interviewed for Bicyclist Safety Research

Name	Organization
John Allen	MassBike
Barbara Bailey	Mass. Parent Teacher Student Association
Rosalie Berquist	Mass. Brain Injury Association
Neil Blackington	Boston EMS
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William F. Weld
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Commissioner

For Immediate Release
June 10, 1996

Julie Vitek (617) 973-7889
Josh Lehman (617) 973-7329

MassHighway Developing Statewide Bicycle and Pedestrian Plans

Boston, MA -- The Massachusetts Highway Department (MHD), through its Bureau of Transportation Planning & Development (BTP&D), has initiated comprehensive Statewide Bicycle and Pedestrian Transportation Plans. The purpose of these plans is to develop policies and practices to improve conditions for bicycling and walking in the Commonwealth. Each plan will take eight months to complete.

MHD has contracted with Vanasse Hangen Brustlin, Inc. (VHB), based in Watertown, for the Statewide Bicycle Transportation Plan, and with Wallace, Floyd, Associates Inc. (WFA), based in Boston, for the Statewide Pedestrian Transportation Plan. Both consulting teams are skilled in the areas of safety, facility design, mapping, and public participation. Josh Lehman, BTP&D's Bicycle-Pedestrian Coordinator, will serve as Project Manager for the two plans.

Two rounds of public meetings around the Commonwealth have been scheduled during both the bicycle and pedestrian planning processes. The first round of public meetings for both plans will be held during the last two weeks of June. Massachusetts residents with an interest in improving bicycling and walking conditions are encouraged to attend. A detailed list of meeting sites follows.

A newsletter highlighting MassHighway's increasing role in improving bicycling and walking conditions around the Commonwealth, including the State Bicycle and Pedestrian Plans, is also being developed. To be added to the mailing list for information on the second-round meetings, and MassHighway's Bicycle-Pedestrian Newsletter, please send your name and address to: Josh Lehman, Bicycle-Pedestrian Coordinator, BTP&D/MHD, 10 Park Plaza, Room 4150, Boston, MA 02116.

**Statewide Bicycle and Pedestrian Plans
First Round Meeting Schedules**

(all meetings are held from 7:00 to 9:00 PM on the dates shown)

Bicycle Plan:

Andover

Tuesday, June 18
West Elementary School Auditorium
58 Beacon Street

Pittsfield

Tuesday, June 18
Berkshire Regional Planning Commission Conference Room
10 Fenn Street

Boston

Tuesday, June 18
City Hall, Room 801
Government Center

Worcester

Thursday, June 20
Central Mass Regional Planning Commission
20 Washington Square, Suite 300

Northampton

Monday, June 24
City Hall, 2nd Floor Hearing Room
210 Main Street

North Easton

Monday, June 24
Stonehill College, Alumni Hall
Route 123

Dennis

Tuesday, June 25
The Dennis Senior Center
1045 Route 134

MASSACHUSETTS

STATEWIDE BICYCLE TRANSPORTATION PLAN

Massachusetts Highway Department
Bureau of Transportation Planning and
Development
10 Park Plaza, Suite 4150
Boston, Massachusetts 02116-3969

Vanasse Hangen Brustlin, Inc.
101 Walnut Street
Post Office Box 9151
Watertown, Massachusetts 02272-9151

What is the Statewide Bicycle Transportation Plan?

The Massachusetts Highway Department (MHD) through its Bureau of Transportation Planning and Development (BTP&D), has initiated the preparation of a comprehensive *Statewide Bicycle Transportation Plan*. The purpose of the plan is to develop policies and practices to improve conditions for bicycling in the Commonwealth. The plan will take approximately eight months to complete.

MHD has contracted with Vanasse Hangen Brustlin, Inc. (VHB), based in Watertown, for the *Statewide Bicycle Transportation Plan*. The VHB team brings to the project skills in the areas of safety, facility design, mapping, and public participation. The team includes the following subconsultants:

Fuss & O'Neill, Inc.
Planners Collaborative, Inc.
Rubel Bikemaps
Rails to Trails Conservancy
University of North Carolina Highway Safety
Research Center

Two rounds of public meetings have been scheduled around the Commonwealth. The first round of public meetings is being held during the last two weeks of June. The purpose of this initial series of meetings is to inform

the public of the scope of work for the *Statewide Bicycle Transportation Plan* and to receive input on the issues, policies, and programs that will be addressed as part of the plan. A second round of public meetings will be held in the late fall to present a draft plan.

How does the plan relate to other studies and efforts?

The *Statewide Bicycle Transportation Plan* will build on past efforts and set a framework for future actions. This plan will function as an integral element of *Accessing the Future: The Intermodal Transportation Plan for the Commonwealth of Massachusetts*. Bicycle-related goals from *Accessing the Future* include:

- Plan, promote, and provide safe travel for bicyclists and pedestrians, in a manner appropriate for each group recognizing that bicycling and walking have distinct operational characteristics and safety requirements
- Provide bicycle and pedestrian facilities and encourage bicycle and pedestrian travel as viable transportation modes
- Reduce demands placed on highway facilities by encouraging the use of Transportation Demand Management (TDM), increasing the use of alternative modes, and providing substitutes for travel



Comment Card

STATEWIDE BICYCLE TRANSPORTATION PLAN

Write your comments and suggestions on this postage paid card, cut along dotted line, and send them to us.
Or send them electronically to BIKEPLAN@VHB.COM

The *Statewide Bicycle Transportation Plan* will also draw upon the *Commonwealth of Massachusetts Bicycle Facilities Inventory*, which was prepared for MHD last year by the Bicycle Coalition of Massachusetts (BCOM), and *Building Better Bicycling: A Manual for Improving Community Bicycling Conditions*, prepared in 1994 by the BayState Roads Program at the University of Massachusetts.

The *Statewide Bicycle Transportation Plan* is being coordinated with the state's 13 regional planning agencies (RPAs). The RPAs are assisting in the public involvement process and providing information on their current long range plans and programs as they relate to bicycling. The RPAs have provided improvements for bicycling throughout the Commonwealth. These projects are drawn from Transportation Improvement Programs (TIPs) developed and submitted to MHD by the RPAs. The Bicycle and Pedestrian Program, within the BTP&D, is responsible for promoting and facilitating greater use of nonmotorized transportation. Educating individuals and other agencies about the need for bicycle and pedestrian considerations in future transportation and land use planning is another facet of the state's program.

What will be included in the Statewide Bicycle Transportation Plan?

The plan will consist of four basic components:

Task A: Establish Vision, Goals, Objectives and Performance Measures

Task B: Assess Current and Future Demand

Task C: Identify Opportunities and Needs

Task D: Develop Recommendations for Project and Policy Implementation

A major effort in Task C will be to develop and test a methodology for assessing the suitability of roadways for bicycling. Roadway characteristics, such as traffic volume and speed, width of travel lanes and shoulder, and truck volume, will be evaluated at sample locations throughout the state. These locations, along five cross-state corridors, will yield a variety of roadway types for study. The methodology will also be designed to gauge the effect of improvements such as shoulder or roadway widenings. After the plan is completed, the methodology will be made available to the RPAs and municipalities to perform more detailed local analysis.

Recommendations will be developed in Task D in the following areas:

- planning, design, construction, and maintenance practices
- education and training programs
- public awareness, incentive, and marketing programs
- enforcement policies and practices
- tourism promotion
- zoning and land use changes



VHB

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For Immediate Release
November 1, 1996

Julie Vitek (617) 973-7889
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Public Meetings for Statewide Bicycle Plan Announced

Boston, MA -- The Massachusetts Highway Department (MHD), through its Bureau of Transportation Planning & Development (BTP&D), is developing a comprehensive Statewide Bicycle Transportation Plan. The purpose of this plan is to provide policies and practices to improve conditions for bicycling in the Commonwealth. The plan is scheduled to be completed in December.

MHD has contracted with Vanasse Hangen Brustlin, Inc. (VHB), for the Statewide Bicycle Transportation Plan. VHB has conducted extensive research on current conditions and potential improvements.

Two rounds of public meetings were scheduled during the bicycle planning process. The first round of public meetings was held in June. The second round of Bicycle Plan meetings, at which findings and recommendations will be presented, is scheduled during mid-November. Those with an interest in improving bicycling conditions are urged to attend.

The Bicycle Plan meetings are listed below. All meetings are scheduled from 7:00 to 9:00 pm.

November 12: Worcester, Central Mass Regional Planning Commission, Suite 300, 20 Washington Square

November 13: Northampton, Council Room (top floor), Municipal Office Building (behind City Hall), 212 Main Street

November 14: Boston, Room 801, City Hall (use Congress Street entrance), Government Center

November 19: Dennis, Dennis Senior Center, downstairs meeting room, 1045 Route 134

November 20: Taunton, SE Regional Planning and Economic Development Commission, 88 Broadway

November 21: Andover, West Middle School Cafeteria, 100 Shawsheen Road

November 26: Pittsfield, Berkshire County Regional Planning Commission, 10 Fenn Street

Appendix B

Regional Planning Agency Goals and Objectives, and Directory

Regional Planning Agency Goals and Objectives

Berkshire Regional Planning Commission

The following bicycle related goals and objectives are contained in the *Berkshire MPO Transportation Plan*.⁶⁵

Goal

Provide for safe, economical efficient and convenient movement of people and goods over a balanced multi-modal transportation system compatible with the socio-economic and environmental characteristics of the region.

Objectives

2. Improved public safety by minimizing conflicts between trucks and autos, and vehicles and pedestrians through provision of appropriate facilities for pedestrians, bicycles, and trucks; and improved safety of existing roads

through reconstruction, installation of guard rails and improved maintenance.

Cape Cod Commission

Goals

The following bicycle-related goal is contained in *The Cape Cod 1997 Regional Transportation Plan*.⁶⁶

1. To reduce dependence on private automobiles by developing and integrating alternate modes (e.g., rail, bus, ferry, air, bicycle and pedestrian) into the transportation system and by promoting substitutes for transportation such as telecommunications.

The *Plan's* policy preamble states: "It is the policy of the *Regional Transportation Plan* that transportation solutions be consistent with Barnstable County Ordinance 96-8, otherwise known as the Cape Cod Commission Regional Policy Plan (RPP).

65 Berkshire Regional Planning Commission, 1997.

66 Cape Cod Commission, 1997.

The RPP includes two transportation goals:

4.1.1 Goal: To establish and maintain a multi-modal transportation system on Cape Cod for present and future year-round and seasonal needs which is safe, convenient, accessible, effective, economical and consistent with the Cape's historic, scenic and natural resources, and land use development and growth management policy.

4.1.2 Goal: To decrease dependence on private automobiles, address demonstrated public needs for convenient, accessible, economical alternatives to private automobiles, and promote energy efficiency and reduced pollution by developing and integrating modes (e.g., rail, bus, ferry, air, bicycle and pedestrian) into the transportation system and by promoting substitutes for transportation such as telecommunications.

Objectives

The 1993 *Long Range Transportation Plan for Cape Cod*⁶⁷ also details specific bicycle-related objectives:

- Develop Cape-wide, interconnected system of bikeways for both recreational and commuter use.
- Consider bicycle legislation.
- Require new development to provide facilities for bicycle use: bike storage areas, easements for future bikepaths, etc.
- Provide for safer movement through rotaries.
- Provide decent road shoulders for both recreational and commuter bike travel.

- Provide ancillary services in public areas to encourage biking (i.e. rest rooms, secure bike storage facilities).
- Provide promotional information and other incentives for bicycling.
- Develop traffic calming strategies with bicycles as an element.

Central Massachusetts Regional Planning Commission

The following bicycle related goals and objectives are contained in the *Central Massachusetts MPO 1997 Regional Transportation Plan*:⁶⁸

Goal

Continue to support the development of the regional bikeway network proposed in the 1978 Regional Bikeway Plan. The 1982 plan also recommended four refinements that should be made:

- Include all of CMRPC's communities (several towns did not participate in the 1978 Bikeway Plan)
- Identify potential bikeway routes that would serve utilitarian trips in Worcester and other urban areas.
- Identify where bicycle storage facilities are needed
- Classify proposed bikeways by type of route.

⁶⁷ Cape Cod Commission, 1993.

⁶⁸ Central Massachusetts Regional Planning Commission, 1997.

Objectives

- 1 Establish performance criteria for the bicycle network.
- 2 Inventory existing bicycle facilities and the associated roadway system
- 3 Identify bicycle travel corridors and desire lines.
- 4 Evaluate and select specific route treatments.
- 5 Select appropriate design treatments.
- 6 Evaluate the completed plan against established performance criteria.

Franklin Regional Council of Governments (COG)

The following bicycling-related goals and objectives are contained in the *Franklin County Long Range Transportation Plan*:⁶⁹

Goal

1. Enhance mobility of Franklin Regional COG residents. Ensure that Franklin Regional COG residents are able to travel freely and efficiently with transportation alternatives.
3. Improve air quality and conserve energy by reducing automobile use and emissions.
5. Improve safety. Ensure that Franklin Regional COG roadways and transportation alternatives are safe.

Objectives

1. A. 2. Construct bicycle facilities and provide storage on public transit.
3. A. 2. Construct safe and efficient facilities for transportation alternatives such as bicycles.
5. B. 2. Create and designate bicycle lanes, paths and routes.
5. B. 3. Build bicycle/pedestrian on reconstructed and replaced bridges when feasible.

Martha's Vineyard Commission

The following bicycling-related goals and objectives are contained in the *Regional Transportation Plan for Martha's Vineyard*:⁷⁰

Goal

Different modes of travel must be accommodated within the existing road system.

Protect and manage non-vehicular networks for walking, horseback riding and biking.

Objectives

- 10) Assist the effort to complete a well integrated island wide network of bike paths, and encourage the Steamship Authority to allow free passage for bicycles or keep rates low.

⁶⁹ Franklin Regional COG, 1997.

⁷⁰ Martha's Vineyard Commission, 1997.

Merrimack Valley Planning Commission

The following bicycling-related goals and objectives are contained in the *Merrimack Valley Planning Commission Regional Transportation Plan*.⁷¹

Goals and Objectives

1. Promote the development of a regional transportation system that minimizes the interconnective use of all modes of goods and person transportation in the Valley.
4. Improve the quality of the environment in the Merrimack Valley by promoting projects and programs that help the region to meet all federal air and water quality standards.

Metropolitan Area Planning Council

The following bicycle related goals and objectives are contained in the *MAPC Regional Bicycle and Pedestrian Plan*.⁷²

Goal

Increase the use of bicycles as a means of transportation by means such as removing barriers to bicycling, providing a range of facilities geared to a range of riders and by creating incentives for the increased use of bicycling, among others.

Objectives

Work to create separate facilities for bicycles and pedestrians wherever feasible. Where this is not feasible, for example on some multi-use off-road paths, take steps to prevent conflicts such as striping the paths.

To have bicycling recognized as a legitimate mode of transportation and be fully integrated into the transportation planning process.

To have bicycle access and use requirements be integrated into the design and review of sites, buildings and transportation facilities and laws at the state, regional and local level.

To increase bicycle use by providing a range of facilities and improvements to accommodate bicyclists of varying abilities which takes into consideration different physical constraints and opportunities throughout the region.

To have municipalities, the state transportation agencies, regional agencies, and private entities share the responsibility for creating a more bicycle-friendly environment.

Montachusett Regional Planning Commission

The following bicycling-related goals and objectives are contained in the *Montachusett Regional Planning Commission 1997 Regional Transportation Plan*.⁷³

Goal

A.3. MRPC will also be working with other towns interested in implementing bikeways in order to provide technical assistance in bikeway implementation.

⁷¹ Merrimack Valley Planning Commission, 1997.

⁷² Metropolitan Area Planning Council, 1997.

⁷³ Montachusett Regional Planning Commission, 1997.

Objectives

A proposed regional bikeway network was included as part of the 1987 Regional Bikeway Plan.

Nantucket Planning and Economic Development Commission

The following bicycle related goals and objectives are contained in the *Long Range Transportation Plan: Nantucket, Massachusetts*.⁷⁴

Goal

To provide a transportation system that will move people and goods to, from, and around the Island in a way that is safe, convenient, economical, and consistent with the Island's historic, scenic, and natural resources.

D-6 To construct and maintain an Island-wide system of bicycle paths in accordance with the community's Bike Path Master Plan.

Objectives

D-6.1 Acquire rights-of-way and construct Class I bike paths where appropriate.

D-6.2 Prepare an in-town bike route plan which addresses the problem of bicycle traffic traveling between the core district and the beginnings of the major bike paths on the outskirts of town.

D-6.3 Include bike path right-of-way acquisition and construction activities in the Town's capital improvement program.

D-6.4 Coordinate the Town's efforts to construct bike paths with those of private developers who are required to construct on-site and off-site bike paths as a condition for approval; and supplement state and Town funds for bike path right-of-way and construction activities with impact fees levied against new developments which do not build off-site paths.

D-6.5 Promote safe bicycling by publicizing traffic laws which apply to bikers; help drivers to be aware of bikers' rights and needs.

Northern Middlesex Council of Governments

The Northern Middlesex Council of Governments' 1997 *Long Range Transportation Plan* contains the following five objective which indirectly relate to bicycling.⁷⁵

Goal

The general transportation goals of the plan are to develop a balanced, multi-modal, cost effective, transportation system connection points inside and outside the Northern Middlesex Region. The plan also strives to:

1. provide safe and convenient transportation services to all residents, especially the transit groups such as the elderly and the handicapped
2. maximize energy conservation, improve air quality and minimize traffic congestion, and
3. encourage development patterns consistent with local and regional land use policies.

74 Nantucket Planning and Economic Development Commission, 1997.

75 Northern Middlesex Council of Governments, 1997.

Objectives

B. Increase Integration and Connectivity Between Various Transportation Modes

Connectivity between modes is crucial to the effectiveness of the transportation system. Allowing for safe and convenient transfers between modes improves the overall efficiency of transportation by better distributing travelers between modes, thereby minimizing congestion of a particular mode. Information relative to the effectiveness of public transportation, ridesharing, bicycling and walking, should be provided to the traveling public.

C. Reduce Congestion on Existing Facilities

Congestion results in increased travel time, increased air pollution, and frustration on the part of the traveling public. Existing facilities can be improved by operational improvements and better intermodal connections. Other options such as reducing travel demand through employer based ridesharing and telecommuting can also play a role in relieving congestion. Expanding existing facilities is often the most direct way to alleviate congestion, although it is not always the most cost effective. Improved methods of providing information about congestion trouble spots to commuters may make travelers aware of alternative routes and modes.

G. Encourage development in the Areas Most Suitable as is Consistent with Regional and Local Land Use Policies

Compact mixed-use development brings jobs, housing, and shopping closer together. The trips are shorter, which encourages walking and bicycling. Cities such as Lowell already have compact mixed use development. This land use

pattern should be supported by transportation service adequate to the city's efforts to maintain and regain its economic vitality.

I. The Regional Transportation System Must be Planned, Designed, Constructed, Operated and Maintained to Preserve and Promote Environmental Quality.

Transportation affects the environment by producing air pollution, producing runoff that affects soils and drinking water, by taking up land, and by affecting communities with noise and visual impacts. Air quality can be improved by encouraging the use of modes which reduce the amount of emission per passenger per mile. Ridesharing, transit, bicycling, and walking are beneficial as compared to using the single occupant automobile. Alternative fuels and new engine technologies also offer hope for the future.

J. Minimize the use of Energy Resources.

The most efficient mode of transportation save energy by using fewer vehicles to carry a given number of people. As vehicle occupancy rates increase, the amount of energy used per passenger mile decreases. The use of the most energy efficient modes such as transit, ridesharing, bicycling, and walking, should be encouraged wherever practical.

Old Colony Planning Council

The following bicycling-related goals and objectives are contained in the *Old Colony Planning Council Long Range Transportation Plan*.⁷⁶

⁷⁶ Old Colony Planning Council, 1997.

Goals

Encourage/promote bicycle riding as a viable alternative to automobile commuting and means of improving air quality.

Encourage/promote safe bicycle riding, and reduce the number of injuries and fatalities associated with bicycle crashes.

Support bicycle riding as a part of intermodal travel.

Identify, designate and implement additional bicycle paths and routes to be used for both commuting and recreation.

Coordinate efforts to improve bicycle facilities with surrounding municipalities and regional agencies.

Objectives

A coordinated effort of local officials, with the Massachusetts Highway Department, the Regional Planning Agencies and interest groups, should encourage and promote the use of existing designated bicycle routes as a viable alternative to automobile commuting through public information and awareness efforts.

To help ensure safe travel habits and reduce the number of bicycle crashes, education programs for all road users should be implemented. Coordination of municipalities with the Department of Education, Registry of Motor Vehicles and transportation agencies should be a part of this effort.

Coordination between different modes of transportation should include the improvement of bicycle access to public transportation. This can

include bus bicycle racks, permits to allow bicycles on train cars, bicycle lockers at park-and-ride lots, train stations and bus terminals, and bicycle racks at industrial, commercial and technical parks.

Local officials, in concert with state and regional planners, should investigate the development of additional bicycle paths and routes which could safely serve the commuting public. This can include the development of abandoned railroad rights-of-way as bicycle paths, and bikeways that connect industrial/business parks, shopping centers, schools and other key destinations.

To help form a more complete and contiguous network of bicycle facilities in the Old Colony Planning Region and southeastern Massachusetts, local agencies should coordinate efforts with agencies and organizations outside the region. This can include researching the existing bicycle facilities of surrounding towns before formalizing new bikeways, and coordinating public outreach programs to help minimize the cost of these efforts.

Pioneer Valley Planning Commission

The following bicycling-related goals and objectives are contained in the *Pioneer Valley Planning Commission Regional Transportation Plan, 1997 update*.⁷⁷

Vision

The Pioneer Valley Region is a safe, convenient place to walk, or ride a bicycle. An expanding network of bikeways, sidewalks and accommodating roadways provides every resident with

⁷⁷ Pioneer Valley Planning Commission, 1997.

access to a wide variety of transportation alternatives for travel to and destination.

Objectives

1. The Pioneer Valleys region's bicycle and pedestrian facilities form a complete network, providing a level of mobility comparable to the present road and highway system. This system connects residential, educational and commercial districts, making it convenient for people to walk or bicycle to and from home, school, work, shopping and entertainment.
2. The experience of walking and bicycling in the Pioneer Valley is a safe one.
3. The Pioneer Valley region's bicycle and pedestrian facilities are a convenient and accessible way to travel.
4. The experience of bicycling and walking in the Pioneer Valley region is aesthetically pleasing.
5. The Pioneer Valley region offers a supportive environment for incorporating walking and bicycling into daily travel activity.

Southeastern Regional Planning and Economic Development District

The following bicycling-related goals and objectives are contained in the *Southeastern Regional and Economic Development District Plan*.⁷⁸

Goal

The goal of transportation planning in the SRPEDD region is the development and maintenance of an effective, accessible transportation system which operates in a safe, economical, efficient and environmentally sound manner, providing a range of modal choices for both people and freight.

The primary goal of this bikeway plan is to create an interconnected network that makes bicycle travel a safe alternative means of transportation.

Objectives

To connect municipal centers with one another, by as many Class I and Class II bikeways as feasible.

Where possible, pedestrian walkways and bike paths/lanes should be incorporated and constructed in future road and subdivision projects.

Class III designs should only occur when alternative routings are not possible, and if planned, these routes should be placed only on streets with limited traffic and/or ones with shoulders or breakdown lanes.

Mitigation should be required of developers along roadways included in this plan, to secure the necessary land for bikeways.

⁷⁸ Southeastern Regional and Economic Development District Plan, 1997.

Regional Planning Agency Directory

Mailing addresses and telephone numbers of Massachusetts' 13 regional planning agencies (RPAs) are provided below. Questions about regional bicycle transportation planning should be directed to the Transportation Program Manager at the appropriate RPA. A listing of towns and cities with RPA affiliation is provided for reference.

Berkshire Regional Planning Commission
33 Dunham Mall
Pittsfield, MA 01201-6207
413.442.1521

Cape Cod Commission
3225 Main Street
Barnstable, MA 02630
508.362.3828

Central Massachusetts Regional Planning Commission
35 Harvard Street - 2nd Floor
Worcester, MA 01609-2801
508.756.7717

Franklin Regional Council of Governments
Court House
425 Main Street
Greenfield, MA 01301
413.774.1193

Martha's Vineyard Commission
P.O. Box 1447
Oaks Bluff, MA 02557
508.693.3453

Merrimack Valley Planning Commission
160 Main Street
Haverhill, MA 01830
508.374.0519

Metropolitan Area Planning Council
60 Temple Place
Boston, MA 02111
617.451.2770

Montachusett Regional Planning Commission
R 1427 Water Street
Fitchburg, MA 01420
978.345.7376

Nantucket Planning & Economic Development Commission
One East Chestnut Street
Nantucket, MA 02554
508.228.7233

Northern Middlesex Council of Governments
Gallagher Terminal
Floor 3B 115 Thorndike Street
Lowell, MA 01852
978.454.8021

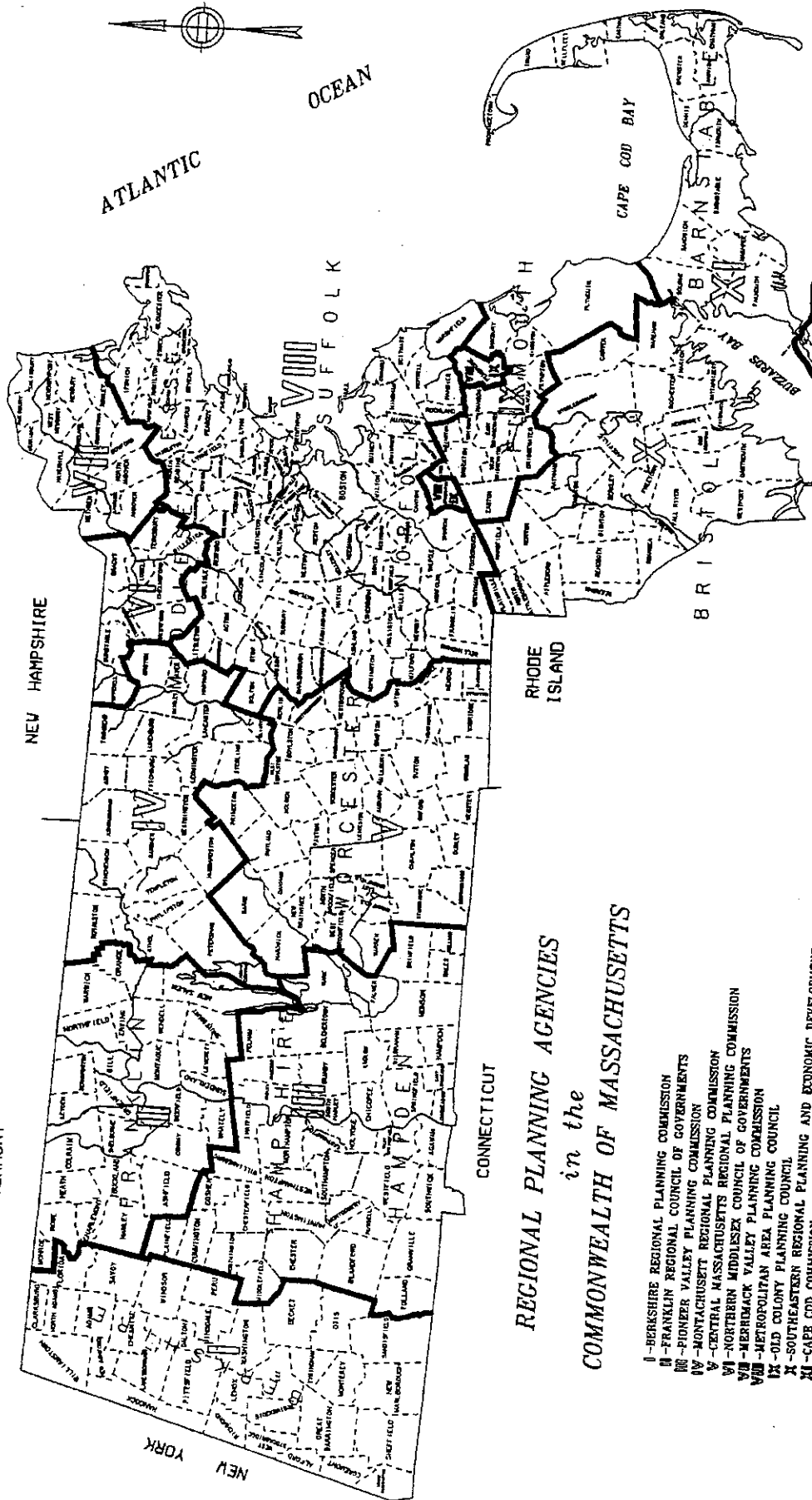
Old Colony Planning Council
70 School Street
Brockton, MA 02401
508.583.1833

Pioneer Valley Planning Commission
26 Central Street
West Springfield, MA 01089
413.781.6045

Southeastern Regional Planning and Economic Development District
88 Broadway
Taunton, MA 02780
508.824.1367

VERMONT

NEW HAMPSHIRE



REGIONAL PLANNING AGENCIES
in the
COMMONWEALTH OF MASSACHUSETTS

- I - BERKSHIRE REGIONAL PLANNING COMMISSION
- II - FRANKLIN REGIONAL COUNCIL OF GOVERNMENTS
- III - PIONEER VALLEY PLANNING COMMISSION
- IV - MONTACHUSETT REGIONAL PLANNING COMMISSION
- V - CENTRAL MASSACHUSETTS REGIONAL PLANNING COMMISSION
- VI - NORTHERN MIDDLESEX REGIONAL PLANNING COMMISSION
- VII - MERRIMACK VALLEY PLANNING COMMISSION
- VIII - METROPOLITAN AREA PLANNING COUNCIL
- IX - OLD COLONY PLANNING COUNCIL
- X - SOUTHEASTERN REGIONAL PLANNING AND ECONOMIC DEVELOPMENT DISTRICT
- XI - CAPE COD COMMISSION
- XII - MARTHA'S VINEYARD COMMISSION
- XIII - NANTUCKET PLANNING AND ECONOMIC DEVELOPMENT COMMISSION

MASSACHUSETTS

NANTUCKET SOUND

ATLANTIC

OCEAN

SUFFOLK

RHODE ISLAND

BRISTOL

CONNECTICUT

NEW YORK

RPA Affiliation of Towns and Cities

Abington	Old Colony Planning Council	Boxford	Merrimack Valley PC
Acton	Metropolitan Area Planning Council	Boylston	Central Massachusetts RPC
Acushnet	Southeastern Regional Planning	Braintree	Metropolitan Area Planning Council
Adams	Berkshire RPC	Brewster	Cape Cod Commission
Agawam	Pioneer Valley PC	Bridgewater	Old Colony Planning Council
Alford	Berkshire RPC	Brimfield	Pioneer Valley PC
Amesbury	Merrimack Valley PC	Brockton	Old Colony Planning Council
Amherst	Pioneer Valley PC	Brookfield	Central Massachusetts RPC
Andover	Merrimack Valley PC	Brookline	Metropolitan Area Planning Council
Arlington	Metropolitan Area Planning Council	Buckland	Franklin Regional COG
Ashburnham	Montachusett RPC	Burlington	Metropolitan Area Planning Council
Ashby	Montachusett RPC	Cambridge	Metropolitan Area Planning Council
Ashfield	Franklin Regional COG	Canton	Metropolitan Area Planning Council
Ashland	Metropolitan Area Planning Council	Carlisle	Metropolitan Area Planning Council
Athol	Montachusett RPC	Carver	Southeastern Regional Planning
Attleboro	Southeastern Regional Planning	Charlemont	Franklin Regional COG
Auburn	Central Massachusetts RPC	Charlton	Central Massachusetts RPC
Avon	Old Colony Planning Council	Chatham	Cape Cod Commission
Ayer	Montachusett RPC	Chelmsford	Northern Middlesex COG
Barnstable	Cape Cod Commission	Chelsea	Metropolitan Area Planning Council
Barre	Central Massachusetts RPC	Cheshire	Berkshire PC
Becket	Berkshire RPC	Chester	Pioneer Valley PC
Bedford	Metropolitan Area Planning Council	Chesterfield	Pioneer Valley PC
Belchertown	Pioneer Valley PC	Chicopee	Pioneer Valley PC
Bellingham	Metropolitan Area Planning Council	Chilmark	Martha's Vineyard Commission
Belmont	Metropolitan Area Planning Council	Clarksburg	Berkshire RPC
Berkley	Southeastern Regional Planning	Clinton	Montachusett RPC
Berlin	Central Massachusetts RPC	Cohasset	Metropolitan Area Planning Council
Bernardston	Franklin Regional COG	Colrain	Franklin Regional COG
Beverly	Metropolitan Area Planning Council	Concord	Metropolitan Area Planning Council
Billerica	Northern Middlesex COG	Conway	Franklin Regional COG
Blackstone	Central Massachusetts RPC	Cummington	Pioneer Valley PC
Blandford	Pioneer Valley PC	Dalton	Berkshire RPC
Bolton	Metropolitan Area Planning Council	Danvers	Metropolitan Area Planning Council
Boston	Metropolitan Area Planning Council	Dartmouth	Southeastern Regional Planning
Bourne	Cape Cod Commission	Dedham	Metropolitan Area Planning Council
Boxborough	Metropolitan Area Planning Council	Deerfield	Franklin Regional COG
		Dennis	Cape Cod Commission
		Dighton	Southeastern Regional Planning
		Douglas	Central Massachusetts RPC

Dover	Metropolitan Area Planning Council	Hamilton	Metropolitan Area Planning Council
Dracut	Northern Middlesex COG	Hampden	Pioneer Valley PC
Dudley	Central Massachusetts RPC	Hancock	Berkshire RPC
Dunstable	Northern Middlesex COG	Hanover	Metropolitan Area Planning Council
Duxbury	Metropolitan Area Planning Council	Hanson	Old Colony Planning Council
East Bridgewater	Old Colony Planning Council	Hardwick	Central Massachusetts RPC
East Brookfield	Central Massachusetts RPC	Harvard	Montachusett RPC
East Longmeadow	Pioneer Valley PC	Harwick	Cape Cod Commission
Eastham	Cape Cod Commission	Hatfield	Pioneer Valley PC
Easthampton	Pioneer Valley PC	Haverhill	Merrimack Valley PC
Easton	Old Colony Planning Council	Hawley	Franklin Regional COG
Edgartown	Martha's Vineyard Com- mission	Heath	Franklin Regional COG
Egremont	Berkshire RPC	Hingham	Metropolitan Area Planning Council
Erving	Franklin Regional COG	Hinsdale	Berkshire RPC
Essex	Metropolitan Area Planning Council	Holbrook	Metropolitan Area Planning Council
Everett	Metropolitan Area Planning Council	Holden	Central Massachusetts RPC
Fairhaven	Southeastern Regional Planning	Holland	Pioneer Valley PC
Fall River	Southeastern Regional Planning	Holliston	Metropolitan Area Planning Council
Falmouth	Cape Cod Commission	Holyoke	Pioneer Valley PC
Fitchburg	Montachusett RPC	Hopedale	Central Massachusetts RPC
Florida	Berkshire RPC	Hopkinton	Metropolitan Area Planning Council
Foxborough	Metropolitan Area Planning Council	Hubbardston	Montachusett RPC
Framingham	Metropolitan Area Planning Council	Hudson	Metropolitan Area Planning Council
Franklin	Metropolitan Area Planning Council	Hull	Metropolitan Area Planning Council
Freetown	Southeastern Regional Planning	Huntington	Pioneer Valley PC
Gardner	Montachusett RPC	Ipswich	Metropolitan Area Planning Council
Gay Head	Martha's Vineyard Com- mission	Kingston	Old Colony Planning Council
Georgetown	Merrimack Valley PC	Lakefield	Southeastern Regional Planning
Gill	Franklin Regional COG	Lancaster	Montachusett RPC
Gloucester	Metropolitan Area Planning Council	Lanesborough	Berkshire RPC
Goshen	Pioneer Valley PC	Lawrence	Merrimack Valley PC
Gosnold	Martha's Vineyard Com- mission	Lee	Berkshire RPC
Grafton	Central Massachusetts RPC	Leicester	Central Massachusetts RPC
Granby	Pioneer Valley PC	Lenox	Berkshire RPC
Granville	Pioneer Valley PC	Leominster	Montachusett RPC
Great Barrington	Berkshire RPC	Leverett	Franklin Regional COG
Greenfield	Franklin Regional COG	Lexington	Metropolitan Area Planning Council
Groton	Montachusett RPC	Leyden	Franklin Regional COG
Groveland	Merrimack Valley PC	Lincoln	Metropolitan Area Planning Council
Hadley	Pioneer Valley PC	Littleton	Metropolitan Area Planning Council
Halifax	Old Colony Planning Council	Longmeadow	Pioneer Valley PC
		Lowell	Northern Middlesex COG
		Ludlow	Pioneer Valley PC

Lunenburg	Montachusett RPC	Natick	Metropolitan Area
Lynn	Metropolitan Area		Planning Council
Lynnfield	Planning Council	Needham	Metropolitan Area
	Metropolitan Area		Planning Council
Malden	Metropolitan Area	New Ashford	Berkshire RPC
	Planning Council	New Bedford	Southeastern Regional
Manchester	Metropolitan Area		Planning
	Planning Council	New Braintree	Central Massachusetts RPC
Mansfield	Southeastern Regional	New Marlborough	Berkshire RPC
	Planning	New Salem	Franklin Regional COG
Marblehead	Metropolitan Area	Newbury	Merrimack Valley PC
	Planning Council	Newburyport	Merrimack Valley PC
Marion	Southeastern Regional	Newton	Metropolitan Area
	Planning		Planning Council
Marlborough	Metropolitan Area	Norfolk	Metropolitan Area
	Planning Council		Planning Council
Marshfield	Metropolitan Area	North Adams	Berkshire RPC
	Planning Council	North Andover	Merrimack Valley PC
Mashpee	Cape Cod Commission	North Attleborough	Southeastern Regional
Mattapoisett	Southeastern Regional		Planning
	Planning	North Brookfield	Central Massachusetts RPC
Maynard	Metropolitan Area	North Reading	Metropolitan Area
	Planning Council		Planning Council
Medfield	Metropolitan Area	Northampton	Pioneer Valley PC
	Planning Council	Northborough	Central Massachusetts RPC
Medford	Metropolitan Area	Northbridge	Central Massachusetts RPC
	Planning Council	Northfield	Franklin Regional COG
Medway	Metropolitan Area	Norton	Southeastern Regional
	Planning Council		Planning
Melrose	Metropolitan Area	Norwell	Metropolitan Area
	Planning Council		Planning Council
Mendon	Central Massachusetts RPC	Norwood	Metropolitan Area
Merrimac	Merrimack Valley PC		Planning Council
Methuen	Merrimack Valley PC	Oak Bluffs	Martha's Vineyard Com-
Middleborough	Southeastern Regional		mission
	Planning	Oakham	Central Massachusetts RPC
Middlefield	Pioneer Valley PC	Orange	Franklin Regional COG
Middleton	Metropolitan Area	Orleans	Cape Cod Commission
	Planning Council	Otis	Berkshire RPC
Milford	Metropolitan Area	Oxford	Central Massachusetts RPC
	Planning Council	Palmer	Pioneer Valley PC
Millbury	Central Massachusetts RPC	Paxton	Central Massachusetts RPC
Millis	Metropolitan Area	Peabody	Metropolitan Area
	Planning Council		Planning Council
Millville	Central Massachusetts RPC	Pelham	Pioneer Valley PC
Milton	Metropolitan Area	Pembroke	Old Colony Planning
	Planning Council		Council & MAPC
Monroe	Franklin Regional COG	Pepperell	Northern Middlesex COG
Monson	Pioneer Valley PC	Peru	Berkshire RPC
Montague	Franklin Regional COG	Petersham	Montachusett RPC
Monterey	Berkshire RPC	Phillipston	Montachusett RPC
Montgomery	Pioneer Valley PC	Pittsfield	Berkshire RPC
Mt. Washington	Berkshire RPC	Plainfield	Pioneer Valley PC
Nahant	Metropolitan Area	Plainville	Southeastern Regional
	Planning Council		Planning
Nantucket	Nantucket P&EDC	Plymouth	Old Colony Planning
			Council

Plympton	Old Colony Planning Council	Southwick	Pioneer Valley PC
Princeton	Central Massachusetts RPC	Spencer	Central Massachusetts RPC
Provincetown	Cape Cod Commission	Springfield	Pioneer Valley PC
Quincy	Metropolitan Area Planning Council	Sterling	Montachusett RPC
Randolph	Metropolitan Area Planning Council	Stockbridge	Berkshire RPC
Raynham	Southeastern Regional Planning	Stoneham	Metropolitan Area Planning Council
Reading	Metropolitan Area Planning Council	Stoughton	Old Colony Planning Council & MAPC
Rehoboth	Southeastern Regional Planning	Stow	Metropolitan Area Planning Council
Revere	Metropolitan Area Planning Council	Sturbridge	Central Massachusetts RPC
Richmond	Berkshire RPC	Sudbury	Metropolitan Area Planning Council
Rochester	Southeastern Regional Planning	Sunderland	Franklin Regional COG
Rockland	Metropolitan Area Planning Council	Sutton	Central Massachusetts RPC
Rockport	Metropolitan Area Planning Council	Swampscott	Metropolitan Area Planning Council
Rowe	Franklin Regional COG	Swansea	Southeastern Regional Planning
Rowley	Merrimack Valley PC	Taunton	Southeastern Regional Planning
Royalston	Montachusett RPC	Templeton	Montachusett RPC
Russell	Pioneer Valley PC	Tewksbury	Northern Middlesex COG
Rutland	Central Massachusetts RPC	Tisbury	Martha's Vineyard Commission
Salem	Metropolitan Area Planning Council	Tolland	Pioneer Valley PC
Salisbury	Merrimack Valley PC	Topsfield	Metropolitan Area Planning Council
Sandisfield	Berkshire RPC	Townshend	Montachusett RPC
Sandwich	Cape Cod Commission	Truro	Cape Cod Commission
Saugus	Metropolitan Area Planning Council	Tyngsborough	Northern Middlesex COG
Savoy	Berkshire RPC	Tyringham	Berkshire RPC
Scituate	Metropolitan Area Planning Council	Upton	Central Massachusetts RPC
Seekonk	Southeastern Regional Planning	Uxbridge	Central Massachusetts RPC
Sharon	Metropolitan Area Planning Council	Wakefield	Metropolitan Area Planning Council
Sheffield	Berkshire RPC	Wales	Pioneer Valley PC
Shelburne	Franklin Regional COG	Walpole	Metropolitan Area Planning Council
Sherborn	Metropolitan Area Planning Council	Waltham	Metropolitan Area Planning Council
Shirley	Montachusett RPC	Ware	Pioneer Valley PC
Shrewsbury	Central Massachusetts RPC	Wareham	Southeastern Regional Planning
Shutesbury	Franklin Regional COG	Warren	Central Massachusetts RPC
Somerset	Southeastern Regional Planning	Warwick	Franklin Regional COG
Somerville	Metropolitan Area Planning Council	Washington	Berkshire RPC
South Hadley	Pioneer Valley PC	Watertown	Metropolitan Area Planning Council
Southampton	Pioneer Valley PC	Wayland	Metropolitan Area Planning Council
Southborough	Metropolitan Area Planning Council	Webster	Central Massachusetts RPC
Southbridge	Central Massachusetts RPC	Wellesley	Metropolitan Area Planning Council
		Wellfleet	Cape Cod Commission
		Wendell	Franklin Regional COG

Wenham	Metropolitan Area Planning Council
West Boylston	Central Massachusetts RPC
West Bridgewater	Old Colony Planning Council
West Brookfield	Central Massachusetts RPC
West Newbury	Merrimack Valley PC
West Springfield	Pioneer Valley PC
West Stockbridge	Berkshire RPC
West Tisbury	Martha's Vineyard Com- mission
Westborough	Central Massachusetts RPC
Westfield	Pioneer Valley PC
Westford	Northern Middlesex COG
Westhampton	Pioneer Valley PC
Westminster	Montachusett RPC
Weston	Metropolitan Area Planning Council
Westport	Southeastern Regional Planning
Westwood	Metropolitan Area Planning Council
Weymouth	Metropolitan Area Planning Council
Whately	Franklin Regional COG
Whitman	Old Colony Planning Council
Wilbraham	Pioneer Valley PC
Williamsburg	Pioneer Valley PC
Williamstown	Berkshire RPC
Wilmington	Metropolitan Area Planning Council
Winchendon	Montachusett RPC
Winchester	Metropolitan Area Planning Council
Windsor	Berkshire RPC
Winthrop	Metropolitan Area Planning Council
Woburn	Metropolitan Area Planning Council
Worcester	Central Massachusetts RPC
Worthington	Pioneer Valley PC
Wrentham	Metropolitan Area Planning Council
Yarmouth	Cape Cod Commission

Appendix C

Assessing Bicycle Accommodation on Roadways

This plan has built on the professional judgment and limited research of the Traffic Institute's approach to develop a rating system for evaluating bicycle accommodation on existing roadways in the Commonwealth. Identified are basic traffic flow and roadway geometric characteristics (variables) that are thought to have significant impact on bicycle travel:

- total traffic volume
- truck (heavy vehicle) volume
- motor vehicle speed
- outside lane width

Three of the four variables: total traffic volumes, truck volumes (truck volume includes a range of larger vehicles, such as tractor trailers, single-unit trucks, buses, etc.) and motor vehicle speed, have been selected to reflect crucial elements of the traffic flow affecting bicycle travel. The remaining variable, outside lane width, reflects the roadway geometry affecting bicycle travel within the roadway system. Traffic flow and roadway geometry are weighted equally when calculating a "bicycle accommodation" rating of a roadway. The parameters and associated ratings assigned to these parameters for the four variables selected are discussed below.

Bicycle Accommodation Ratings Associated with Peak Hour Traffic Volume

A roadway's peak hour traffic volume determines the maximum number of motor vehicles passing a point in one hour⁷⁹. In addition, potential conflict for bicyclists and motorists substantially increases as traffic volumes approach capacity. As discussed in the Traffic Institute's study, the Highway Capacity Manual⁸⁰ recommends enough roadway lanes be provided at an urban intersection approach such that the total of the through traffic volume plus the right-turn volume does not exceed 450 vehicles per hour per lane (vphpl), assuming the approach receives approximately 50 percent of the signal green time. However, in an area with limited number of signalized intersections, a single lane will conservatively be able to accommodate 900 vphpl. Traffic flow of 900 vphpl equates to approximately 15 vehicles per minute, or one vehicle passing a stationary point every four seconds. This is a relatively high frequency of bicy-

79 Another important roadway traffic measure is average daily traffic - ADT. This measure may be substituted for peak hour traffic volumes in the methodology.)

80 Highway Capacity Manual, Special Report 209; Transportation Research Board, Washington, DC, 1992.

cle/motor vehicle interaction, and it will tend to create a stressful environment for both the bicyclist and motorist. (Studies conducted by the National Highway and Traffic Safety Administration (NHTSA) indicate that intersections are where most bicycle-motor vehicle crashes occur.) Peak hour traffic volume ratings were derived incrementally using a rating of five for 150 or less vphpl and a rating of one for more than 850 vphpl (see Table 6).

A roadway's peak hour traffic volume generally deals with a.m. and p.m. bicycle usage. Bicycle usage is often higher during non-peak periods such as Saturdays, Sundays and during summer months when roadway traffic volumes are lower. It is also important to assess roadway use when bicycle traffic is the greatest.

Bicycle Accommodation Ratings Associated with Motor Vehicle Speed

High motor vehicle speeds may cause bicyclists to become unstable and lose control. Turbulence caused by air displacement of large motor vehicles (referred to as "truck blast") begins to affect the stability of a bicyclist when passing vehicles are traveling at speeds greater than 72.4 kilometers per hour (kph) 45 miles per hour (mph).⁸¹ For these reasons, 45 mph can be considered the threshold parameter for a rating of one for motor vehicle speed. A rating of five was assigned for speeds at or below 48.3 km (30 mph). It is recommended that the 85th percentile speed for each roadway link be used to determine the bicycle accommodation rating for adjacent motor vehicle speed. However, if these data are not available, the posted speed limit can be used as is or modified based on a general per-

ception of actual speeds. Table 7 displays the ranges of ratings associated with motor vehicle speed.

Bicycle Accommodation Ratings Associated with Outside Lane Width

Outside lane width is the distance between the edge of roadway or face of curb and the inside edge of the first travel lane. As defined here, the outside lane is a combination of the outermost travel lane and the adjacent paved, usable shoulder. This total width dictates the available operating space for the bicyclist and the motorist. According to the Traffic Institute study, research done by the Maryland Department of Transportation suggests that an outside lane width of 4.60 m (15 feet) or greater can accommodate bicycles and motor vehicles in the same lane for speeds of 64.4 kph (40 mph) or less. According to the Highway Capacity Manual, bicyclists are not expected to have any impact on motor vehicle traffic where outside lane widths exceed 4.25 m (14 feet). Outside lane widths of 3.35 m (11 feet) or less will have some impact on motor vehicle traffic; however, further research is needed to quantify these impacts. For these reasons, an outside lane width less than 3.5 m (11.5 feet) was assigned a rating of one. Outside lane widths equal to or greater than 5.0 m (16 feet) allow for a standard 3.75 m (12 foot) travel lane and a 1.25 m (4 foot) paved shoulder or bicycle lane. Outside lane widths equal to or greater than 5.0 m (16 feet) were assigned a rating of five. The remaining ratings were derived incrementally as shown in Table C-3.

Bicycle Accommodation Ratings Associated with Truck Frequency

Truck and other heavy vehicle traffic, such as buses, within the outside lane affects bicyclists'

81 De Leuw, Cather and Co., Safety and Location Criteria for Bicycle Facilities - Final Report, US Department of Transportation, FHWA, DOT - FH-11-6134, Washington, DC, 1975.

safety and comfort as a result of instability created by localized turbulence (truck blast), wheel tracking, blind spots in the operator's field of vision, and increased lane width occupied by trucks and buses. According to Van Valkenberg,⁸² bicycle riding with 10 percent trucks on a roadway with an AADT of 2000 vehicles per day (vpd) or 10 trucks per hour is very uncomfortable. For this reason, 10 trucks per hour on a roadway segment was established as the threshold parameter for a rating of one. The remaining ratings for truck frequency were derived incrementally using a rating of five for two or fewer trucks per hour and a rating of one for 10 or more trucks per hour (see Table C-4). The presence and speed of trucks and other heavy vehicles may influence decisions as to appropriate bicycle accommodation.

Overall Rating

The bicycle accommodation rating (r_o) developed in this plan gives equal weight to the combined rating of the three traffic variables and the single rating of the road width variable:

$$r_o = (((r_v + r_t + r_s)/3) + r_w)/2$$

where:

r_v = rating for total traffic volume
 r_t = rating for truck volume
 r_s = rating for motor vehicle speed
 r_w = rating for outside lane width

It should be noted that this rating system is offered as one potential approach and will require additional testing and calibration.

Other Variables

It should be reiterated that the methodology addresses four variables associated with traffic flow and roadway cross section. Other variables, however, should be considered when evaluating a roadway for bicycle accommodation and/or desirability. Some of these are:

- Curb cut / intersection frequency
- Pavement condition
- Location of barrier curbing adjacent to the outside travel lane
- Accident history
- Sight distance
- Grade
- On-street parking

⁸² Van Valkenberg, P., Methodology for Evaluating the Suitability of Two-Lane Two-Way Paved Rural Roads for the Shared Bicycle/Motor Vehicle Use, Wisconsin Division of Tourism, Madison, Wisconsin, 1982.

Table C-1
Bicycle Accommodation Ratings
Associated with Traffic Volumes

Peak Hour Traffic Volume (vph)	Accommodation Rating
$x \leq 150$	5.0
$150 < x \leq 250$	4.5
$250 < x \leq 350$	4.0
$350 < x \leq 450$	3.5
$450 < x \leq 550$	3.0
$550 < x \leq 650$	2.5
$650 < x \leq 750$	2.0
$750 < x \leq 850$	1.5
$x > 850$	1.0

Table C-2
Bicycle Accommodation Ratings
Associated with Motor Vehicle Speeds

Motor Vehicle Speeds (mph)	Accommodation Rating
$x \leq 30$	5.0
$30 < x \leq 35$	4.0
$35 < x \leq 40$	3.0
$40 < x \leq 45$	2.0
$x > 45$	1.0

* All field inventory data were measured and are referenced in English units

Table C-3
Bicycle Accommodation Ratings
Associated with Outside Lane Width

Outside Lane Width (feet)	Accommodation Rating
$x \geq 16.0$	5.0
$16.0 > x \geq 15.0$	4.5
$15.0 > x \geq 14.0$	4.0
$14.0 > x \geq 13.5$	3.5
$13.5 > x \geq 13.0$	3.0
$13.0 > x \geq 12.5$	2.5
$12.5 > x \geq 12.0$	2.0
$12.0 > x \geq 11.5$	1.5
$x \leq 11.5$	1.0

* All field inventory data were measured and are referenced in English units

Table C-4
Bicycle Accommodation Ratings
Associated with Truck Frequency

Truck Frequency (Trucks Per Hour)	Accommodation Rating
≤ 2	5.0
$x = 3$	4.5
$x = 4$	4.0
$x = 5$	3.5
$x = 6$	3.0
$x = 7$	2.5
$x = 8$	2.0
$x = 9$	1.5
$x \geq 10$	1.0

In many areas of the state, especially western Massachusetts where road grades can be steep and there are few alternative routes, topography is a major limiting factor.

In a recently completed study,⁸³ the Central Transportation Planning Staff (CTPS) worked with a steering committee to rate roadways in the 13-community MetroWest area. Steering committee members traveled area roadways on bicycles to develop the ratings. The ratings were then reviewed by local staff, including police. The results are displayed on the MetroWest Bike Map which was published and made available to the public.



⁸³ Central Transportation Planning Staff, *MetroWest Bicycle-Pedestrian Study*, October 1996.

Field Inventory

Field Inventory Procedure⁸⁴

To test the methodology described in the previous section, roadways were selected in five cross-state corridors. State and U.S. numbered highways were selected because they generally define the most common travel paths. Roadway inventory locations were then established at approximately 10-mile (16.0 km) intervals along these routes. The specific locations were chosen to be representative samples of the area roadway. Cross sections were not taken every time traffic flow and/or cross sectional characteristics changed, but rather spot locations were inventoried. The position of each inventory location was determined by two methods; first, the exact field position was located by using a Global Positioning System (GPS) navigator, and second, the relative location was marked on a state road map and the closest field mile marker was also noted on the inventory sheet. This procedure allows for the location of the inventory points to be accurately mapped by a Geographic Information System in Universal Transverse Mercator (UTM) coordinates.

Varied data were collected at each inventory location. The posted speed limits were noted at each of inventory locations in addition to actual speed observed in the area of the inventory point. Measurements of the roadway cross section were also taken at each inventory location. These included the inside travel lane, the outside travel lane, the paved shoulder width, the sidewalk width, and distance to any side obstructions measured from the edge of the outside travel lane. Photographs were taken from the roadway edge in each direction at all inventory

⁸⁴ All field inventory data is referenced in English units with Metric equivalents owing to data availability in English units

locations for future reference. Finally, any general observations made during the inventory were included in the general notes section of the inventory sheet. A copy of the field inventory sheet can be found in the Appendix.

Field Inventory and Data Collection Results

The field inventory was performed primarily during August, 1996. As displayed on the following page, 131 point locations were inventoried throughout the Commonwealth. The four main variables affecting bicycle travel within the inventoried roadway system varied throughout the Commonwealth. The outside lane widths varied from approximately 20 feet (6.1 m), such as Route 2 in western Massachusetts, to widths of less than 11 feet (3.35 m) on Route 28 on Cape Cod. Speed limits varied from 25 mph (40 kph) in village and town centers to 55 mph (89 kph) on rural highways and median divided roadways in urban areas. The peak hour traffic volumes varied from 44 vehicles per hour (vph) in the outside travel lane on Route 57 near Tolland to 2,248 vph in the outside travel lane on Route 3A in Quincy. The peak hour truck volumes varied from 1 truck per hour (tph) on low volume rural roadways to greater than 20 tph on high volume roadways.

Typical Accommodation Ratings

Following the methodology discussed in the previous section, each of the 131 field inventory points was tested to determine the bicycle accommodation rating of the specific location. It was found that the ratings ranged from 5.0 on a western portion of Route 2 to 1.1 on portions Cape Cod roadways.

Analysis of the traffic and geometric characteristics at the 131 sample locations indicates that

15 percent rated "low" in bicycle accommodation (1.0 to 2.3). Sixty-one (61) percent of locations rated "moderate" (2.4 to 3.6), while 24 percent rated "high" (see Table C-5).

Table C-5
Range of Bicycle Accommodation
Ratings for Sample Locations

<u>Overall Rating</u>	<u># of Observations</u>	<u>% of Total Observation</u>
Low 1.0–2.3	20	15%
Moderate 2.4–3.6	80	61%
High 3.7–5.0	31	24%
Total	131	100%

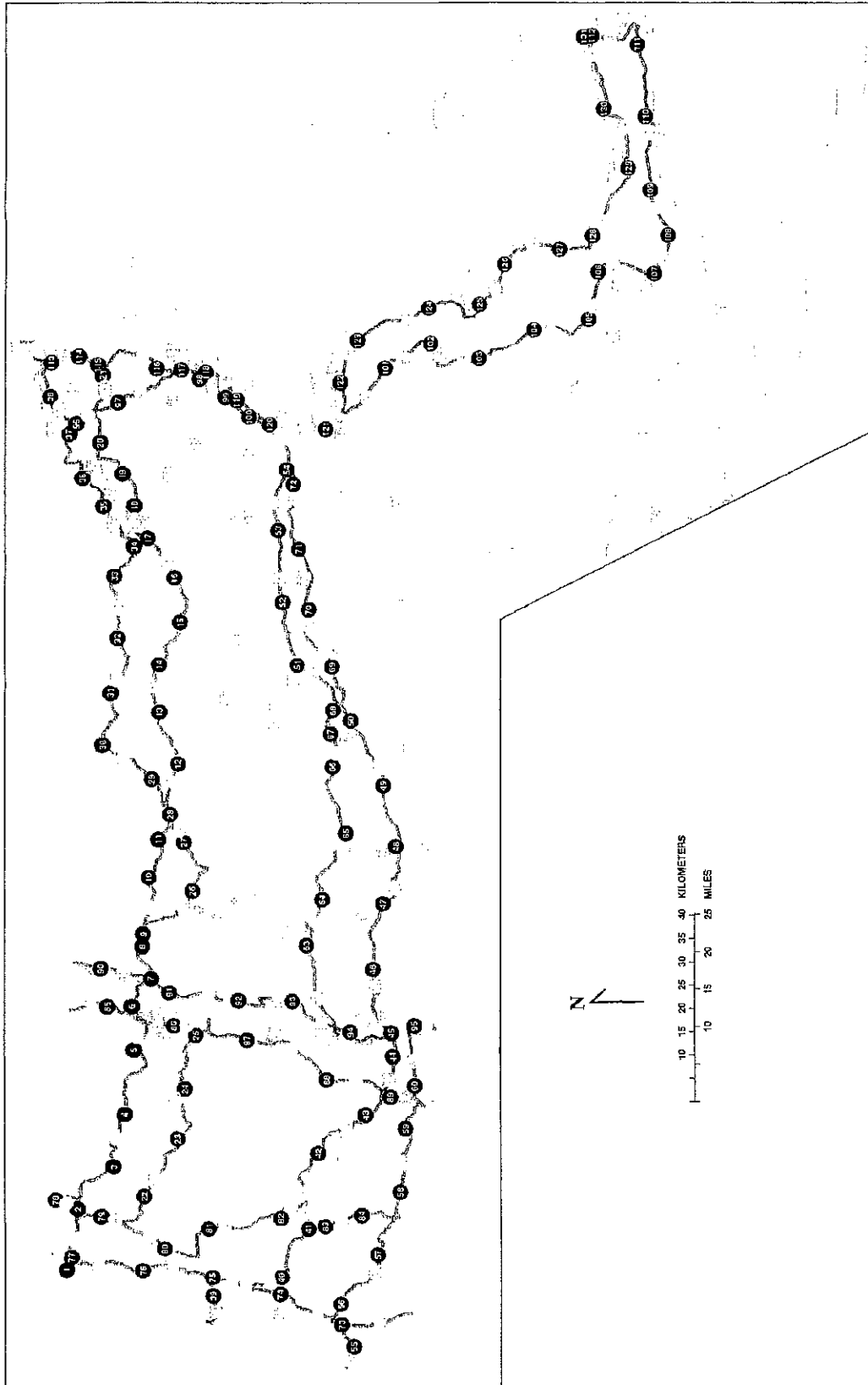
(Note: The primary purpose of assessing locations was to develop a methodology, not to recommend particular locations for bicycling.)

Examples of Massachusetts roadways with various bicycle accommodation ratings are provided on the following page. The two locations with a high rating have the following characteristics:

- Outside lane widths of greater 16 feet (5.0 m),
- Low hourly truck volumes,
- Relatively low peak hour traffic volumes compensating for the relatively high travel speeds,
- Good traffic flow characteristics with adequate outside travel lane widths.

The two examples with a moderate rating have the following characteristics:

- One has narrower outside lane widths with very high travel speeds; however, this section of roadway has very low peak hour traffic volumes minimizing the interaction of bicyclists and motor vehicles,



Legend

ROADWAYS:

- Interstate
- U.S.
- State
- Interstate Highway

OTHER FEATURES:

- Roads under evaluation
- Sample location for data collection

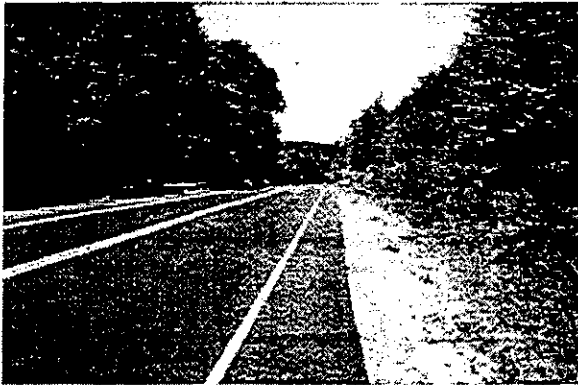


MASSACHUSETTS
STATEWIDE BICYCLE TRANSPORTATION PLAN

Field Inventory Locations

All existing features derived from digital U.S.G.S. files 1:100,000 scale, 1984-1986

Examples of Roadways with Various Bicycle Accommodation Ratings



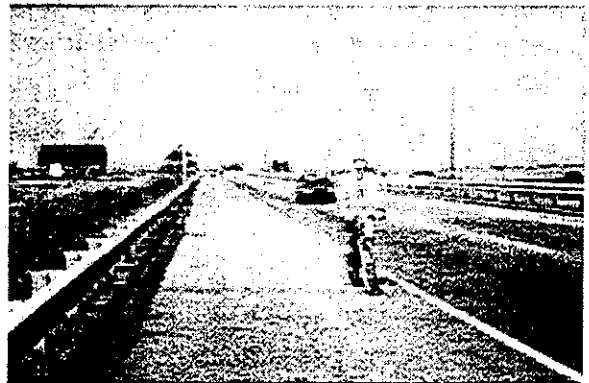
Route 57, Granville Accommodation Rating 4.5
Width: 5.0 m Speed: 72 kph Traffic: 48 vph Trucks: 1 tph



Route 63, Northfield Accommodation Rating 4.3
Width: 6.8 m Speed: 89 kph Traffic: 139 vph Trucks: 2 tph



Route 122, Petersham Accommodation Rating 3.1
Width: 3.8 m Speed: 89 kph Traffic: 119 vph Trucks: 2 tph



Route 107, Revere Accommodation Rating 3.0
Width: 6.1 m Speed: 97 kph Traffic: 1249 vph
Trucks: 19 tph

The other has very high peak hour traffic volumes with very high travel speeds; however, this section of roadway has outside lane widths of 20 feet (6.01 m) maximizing the separation of bicyclists and motor vehicles.

Some of the roadways in the Commonwealth that were sampled had lower ratings for the following reasons:

- Outside lane widths of 12 feet (3.75 m) or less,
- Moderately high peak hour traffic volumes with very high travel speeds,
- Moderately high travel speeds with very high peak hour traffic volumes.

About one-third of all sample locations had outside lane widths including shoulder less than 14 feet (4.3 m). About 20 percent had outside lane widths 14 feet (4.3 m) to 15.9 feet (4.8 m), while nearly half of all locations had outside lanes 16 feet (4.9 m) or wider (see Table C-6).

Table C-6
Range of Outside Lane Widths at
Sample Locations

Outside Lane Width (includes shoulder)	# of Observations	% of Total Observations
< 14.0 ft.	40	31
14.0 ft. to 15.9 ft.	28	21
≥ 16.0 ft.	63	48
Total	131	100

An analysis of paved shoulder widths shows that 53 percent of locations had shoulders 0.6 m (two feet) or wider (see Table C-7). Sample locations in many urban or village areas have wide travel lanes instead of shoulders.

Table C-7
Range of Shoulder Widths at
Sample Locations

Paved Shoulder Width	# of Observations	% of Total Observations
< 2.0 ft.	62	47
2.0 ft. to 3.9 ft.	30	23
≥ 4.0 ft.	39	30
Total	131	100

Sample Corridors

A proposed methodology to evaluate the accommodation of bicycles on existing roadways was developed and tested on the Commonwealth's existing roadway system in five statewide bicycle corridors. The following five statewide corridors were selected to test the methodology:

- North/South
 - The Hoosic River/Housatonic River corridor, including connections between Pittsfield and smaller urban areas.
 - The Connecticut River corridor, including connections between greater Springfield and Greenfield.
 - A coastal corridor, including connections between Newburyport, Boston, Plymouth, and Cape Cod.
- East/West
 - A corridor linking Massachusetts' three largest population areas: Boston, Worcester, and Springfield.
 - A corridor linking the Mohawk Trail on the west to the Merrimack River on the east, including connections between Greenfield, Fitchburg, Ayer/Fort Devens, Lowell, Lawrence, and Haverhill.

Route Selection

Once the five statewide corridors were identified, two existing state or U.S.-numbered roadways per corridor were selected for evaluation. To assist in the selection of routes both *The Commonwealth of Massachusetts Bicycle Facilities Inventory* and the 1987 *Massachusetts Bicycle Map* were reviewed. More importantly, selection was based on routes that provide linkages within the corridor in a continuous, linear manner. The following describes the routes along each corridor that were selected:

- Housatonic River Corridor
 - Route 7 ➤ Route 8
- Connecticut River Corridor
 - Route 5 ➤ Route 63
 - Route 10 ➤ Route 116
 - Route 5
- Coastal Corridor
 - Route 1A ➤ Route 97
 - Route 3A ➤ Route 107
 - Route 6A ➤ Route 53
 - Route 58
 - Route 151
 - Route 28
- Boston/Worcester/Springfield Corridor
 - Route 20 ➤ Route 23
 - Route 57
 - Route 202
 - Route 9
 - Route 122
 - Route 30
- Mohawk Trail/Merrimack River Corridor

- Route 2 ➤ Route 116
- Route 2A ➤ Route 122
- Route 110 ➤ Route 101
- Route 133 ➤ Route 119
- Route 113

Data Collection

Traffic flow and roadway geometric data were collected by VHB for the development of a database that was utilized in evaluating roadways within the five bikeway study corridors. The intent of the data collection effort was twofold: first, for the development of a Bicyclist Accommodation Rating Methodology; and, second, to test the accuracy and compatibility of the Commonwealth's *Road Inventory File* for future use of the methodology. MassHighway's *Road Inventory File* is a computerized database containing information on all public roads and highways within the Commonwealth, and is linked to digital map road segments in ARC/INFO GIS software. While the roadway inventory database was originally compiled from field data collected by MassHighway survey crews from 1969 to 1974, updating has been completed for many roadways by local and regional agencies as well as by MassHighway.

To develop and test the methodology, VHB surveyed typical locations approximately every ten miles for the selected roadways. A Global Positioning System (GPS) navigator was used in the field to obtain accurate location data of the 131 field inventory points. The location data were then directly tied into a GIS base map to graphically represent the field inventory location points. The locations could then be readily input into a GIS and compared to data in the *Road Inventory File*.

The database file developed by VHB was tested in conjunction with the *Road Inventory File* in one

of the test corridors. Traffic flow and roadway geometric characteristics believed to affect bicycling were identified and further reduced. The further reduction of these characteristics are discussed below. The field data collection form and tables summarizing the data and results are provided at the end of this appendix.

Vehicles Per Hour in Outside Lane

Annual average daily traffic (AADT) volumes for representative locations for the selected routes were obtained from the 1994 Traffic Volume Report for the Commonwealth of Massachusetts. A growth rate, based on the Traffic Growth Summary per MassHighway District, was then applied to various AADTs so that a uniform traffic year (1996) could be established. Where directional AADT data were not available, a 60 percent directional distribution factor was applied. As a conservative approach, the resulting traffic volumes were assigned to both directions of travel. Peak hour traffic volumes within the outside lane for a two-lane roadway were then derived by assuming that 10 percent of the daily traffic occurs within the peak hour. Peak hour outside lane traffic volumes for a four-lane roadway were calculated by assuming that 60 percent of the peak hour traffic travels in the outside lane. Peak hour outside lane traffic volumes for a six-lane roadway were calculated by assuming that 40 percent of the peak hour traffic travels in the outside lane.

Outside Lane Width

Outside lane widths for the sample locations were determined by adding the width of the outside travel lane with the width of the usable paved shoulder. If on-street parking was posted,

then the parking area was subtracted from the outside lane width.

Traffic Speed

The 85th percentile speed was not readily available for the roadways within the bikeway study corridors. However, field observations revealed that area traffic generally traveled approximately eight kph (five mph) above the posted speed limit. Therefore, the traffic speed used for analysis purposes was developed by increasing the posted speed limit by eight kph (five mph).

Truck Frequency

Truck traffic volume data are not as readily available as data on total traffic volume. Since most of the roadways that were surveyed throughout the Commonwealth are arterials, a standard rate of 1.5 percent of the peak hour traffic volumes was used to estimate truck volumes. When more detailed regional and local bicycle studies are conducted, selected classification counts should be conducted to determine actual numbers of trucks and other heavy vehicles, such as buses.

Land Use Data

Land use and related data from the Mass GIS were obtained for each of the statewide test corridors. Graphics for the two test corridor examples show spatial data obtained from the following Mass GIS datalayers:

- Land Use Datalayer
 - High density residential (smaller than ¼ lots and multifamily)

- Low density residential (¼ lots and larger)
- Commercial
- Industrial
- Recreation
- Protected and Recreational Open Space Datalayer
 - Conservation land
 - Recreation land

The first two land uses could be classified as bicycle trip generators, while the remaining categories are trip attractions. More detailed inventory data, such as the location of schools, colleges, etc., is needed for bicycle route planning; however, the Mass GIS data provide an excellent foundation.

Test Corridor Examples

The following section discusses two of the previous selected corridors as examples for use of the proposed methodology.

Boston to Sturbridge Test Corridor

Route 20 from was inventoried from Allston to Sturbridge. The roadway changes character throughout its corridor (see following page). In Allston the roadway traverses a business district, and in Weston and Sudbury the roadway is heavily used as a commuter route. In Northborough, Shrewsbury and Sturbridge, the roadway takes on more rural highway characteristics.

Numerous truck climbing lanes are provided throughout the route and the roadway's cross section changes back and forth from two lanes to four lanes. The truck climbing lanes typically use the available shoulder space, leaving little room for bicycle travel in these areas. Some of the attractions along this route include:

- Charles River Bikeway
- Proximity to Bentley College, Brandeis University, Regis College
- Adjacent to Tufts University Veterinary School
- Adjacent to Old Sturbridge Village
- Proximity to Great Meadows National Wildlife Refuge

Table C-8 displays the bicycle accommodation ratings and associated traffic flow and cross sectional characteristics for Route 20 within the corridor.

Key characteristics of the corridor are:

- Bicycle accommodation ratings vary from 1.5 to 3.5
- Outside lane widths vary from 11.5 feet to 23.3 feet (3.5 - 7.1 m)
- Travel speeds vary from 35 mph to 60 mph (56 - 96 kph)
- Peak hour traffic volumes vary from 637 vph to 1673 vph

Table C-8
Route 20 Inventory Results

Inventory #	Route #	Town	Average Width* (feet)	Travel Speed (mph)	Vehicles per Hour	Trucks per Hour	Bicycle Accommodation
							Rating
48	20	Sturbridge	19.8	40	948	14	3.3
49	20	Charlton	11.5	55	657	10	1.5
50	20	Sherborne	23.3	50	1,592	24	3.0
51	20	Northboro	17.8	45	637	10	3.5
52	20	Sudbury	18.8	55	1,277	19	3.0
53	20	Weston	16.5	45	1,561	23	3.2
54	20	Allston	12.0	35	1,673	25	2.0

* Width of outside travel lane and paved shoulder where provided.

Table C-9
Routes 9, 122, and 30 Inventory Results

Inventory #	Route #	Town	Average Width* (feet)	Travel Speed (mph)	Vehicles per Hour	Trucks per Hour	Bicycle Accommodation
							Rating
66	9	Leicester	16.5	35	1,113	17	3.5
67	9(12)	Worcester	18.0	30	1,083	16	3.7
68	122	Worcester	19.0	40	1,558	23	3.3
69	30	Westborough	13.0	45	1,051	16	2.2
70	30	Southborough	12.0	45	1,051	16	1.7
71	30	Wayland	13.3	45	627	1	2.6
72	30	Newton	18.0	35	1,325	20	3.5

* Width of outside travel lane and paved shoulder where provided.

Routes 30, 122 and 9 were inventoried through Newton, Wayland, Southborough, Westborough, Worcester and Leicester. Routes 30 and 122 in Newton and Worcester, respectively, primarily connect outlying areas with business districts and are heavily used as commuter routes. In Westborough and Southborough Route 30 takes on more rural characteristics. Some of the attractions along this route include:

- Boston University
- Boston College
- MBTA Green Line
- Framingham State College



Base map derived from digital U.S.G.S. files 1:100,000 scale, 1984-1986. Land use and open space source data supplied by the Massachusetts Executive Office of Environmental Affairs, MassGIS.

Legend

ROAD AND RAILWAYS:

- Interstate U.S. State
- Interstate highway
- U.S. or state numbered route
- Active, inactive, or abandoned rail
- Rails under evaluation
- Sample location for data collection

LAND USE:

- Recreation
- Conservation
- Low Density Residential
- High Density Residential
- Commercial
- Industrial
- Source of land use data

N



Table C-9 displays the bicycle accommodation rating and associated traffic flow and cross sectional characteristics for Route 30, 122 and 9 within the corridor.

Key characteristics of the corridor are:

- Bicycle accommodation ratings vary from 1.7 to 3.7
- Outside lane widths vary from 12.0 feet to 19.0 feet (3.7 - 5.8 m)
- Travel speeds vary from 30 mph to 45 mph (48 - 72 kph)
- Peak hour traffic volumes vary from 627 vph to 1558 vph

If data were available at increments of changing traffic flow and cross sectional characteristics, recommendations could be made for general improvements within the corridor to better accommodate bicycle travel. In addition, areas of key connections could be identified using the land use data to assist in the programming of any potential improvements.

Connecticut River Valley Test Corridor

Routes 5 and 10 were inventoried from Bernardston to Westfield. The roadway changes character throughout its corridor (see following page). The northern end of the route winds its way through gently rolling terrain in recreational, agricultural, and low density residential areas. Toward the south, especially in the Westfield area, the route takes on a more commercial character and higher residential densities. Some of the attractions along or in close proximity to the route include:

- Norwottuck Rail Trail
- Mount Sugarloaf State Reserve
- Mount Tom
- Hampton Ponds State Park
- Greenfield Community College
- Smith College

- Holyoke Community College
- Westfield College
- Northfield State Forest

Table C-10 displays the bicycle accommodation rating and associated traffic flow and cross sectional characteristics for Routes 5 and 10 within the corridor.

Key characteristics of the corridor are:

- Bicycle accommodation ratings vary from 2.1 to 3.8
- Outside lane widths vary from 12.0 feet to 22.4 feet (3.7 - 6.8 m)
- Travel speeds vary from 35 mph to 50 mph (56 - 80 kph)
- Peak hour traffic volumes vary from 276 vph to 1,100 vph

Routes 63, 116, and 5 were inventoried from Northfield to Longmeadow. The character of this corridor varies dramatically along the route. The northern parts of the corridor are largely agricultural and low density residential areas, whereas the southern parts of the corridor pass through the heavily developed areas in and around the City of Springfield. Some of the attractions along, or in close proximity to, Routes 5 and 10 are:

- Connecticut River Scenic Byway
- Norwottuck Rail Trail
- Mount Toby State Forest
- Holyoke Range State Park
- University of Massachusetts at Amherst
- Wendell State Forest
- Northfield Mountain Recreational Area
- Hampshire College
- Amherst College
- Springfield College
- Basketball Hall of Fame

Table C-11 displays the bicycle accommodation rating and associated traffic flow and cross sectional characteristics for Routes 63, 116, and 5 within the corridor.

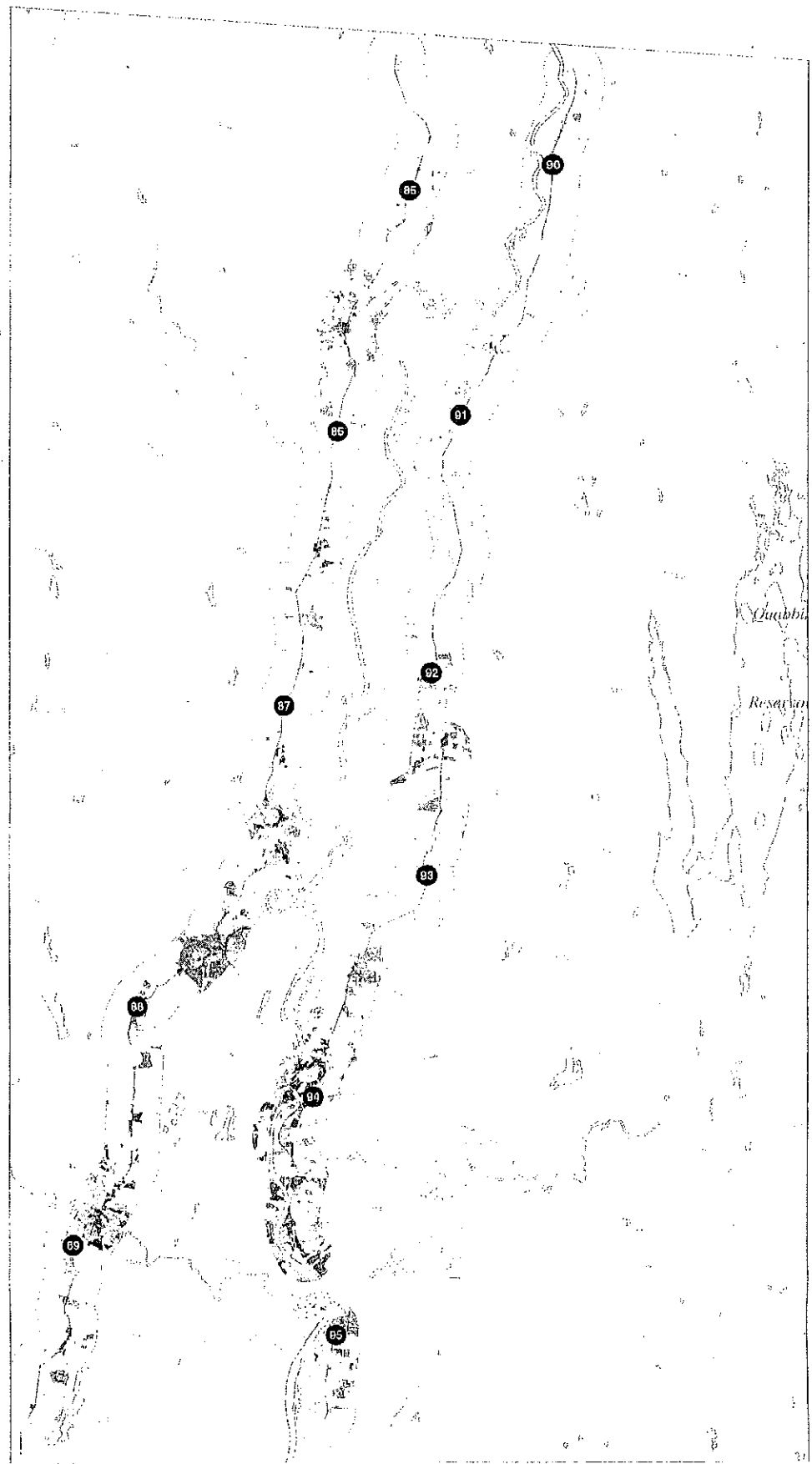
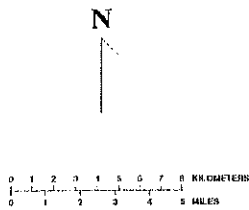
Key characteristics of the corridor are:

- Bicycle accommodation ratings vary from 2.9 to 4.4
- Outside lane widths vary from 12.8 feet to 22.2 feet (3.9 - 6.8 m)
- Travel speeds vary from 35 mph to 60 mph (56 - 96 kph)
- Peak hour traffic volumes vary from 139 vph to 2219 vph

The Amherst location (on Route 63) has a high rating due to the relatively low travel speed and traffic volumes combined with more than ade-

quate lane width which provides lateral separation between bicycles and motor vehicles in the travel lane. Similarly, Route 63 in Northfield also has a high rating due to low traffic volume and a wide outside lane.

If data were available at increments of changing traffic flow and cross sectional characteristics, recommendations could be made concerning general improvements within the corridor to better accommodate bicycle travel. In addition, areas of key connections could be identified using land use data to assist in the programming of any potential improvements.



Legend

ROAD and RAILWAYS:

- Interstate
- U.S. or State
- Interstate highway
- U.S. or state numbered route
- Active, inactive, or abandoned rail
- Route under evaluation
- Sample location for data collection

LAND USE:

- Recreation
- Conservation
- Low Density Residential
- High Density Residential
- Commercial
- Industrial
- Bounds of land use data



MASSACHUSETTS

STATEWIDE BICYCLE TRANSPORTATION PLAN

Connecticut River Valley Test Corridor

Base map derived from digital U.S.G.S. files 1:100,000 scale, 1984-1986. Land use and open space source data supplied by the Massachusetts Executive Office of Environmental Affairs, MasGIS.

Table C-10
Routes 5 and 10 Inventory Results

Inventory #	Route #	Town	Average Width* (feet)	Travel Speed (mph)	Vehicles per Hour	Trucks per Hour	Bicycle Accommodation Rating
85	5/10	Barnardston	12.0	50	276	4	2.4
86	5/10	Deerfield	16.1	50	484	7	3.5
87	5/10	Hatfield	15.3	50	681	10	2.9
88	10	Southampton	12.5	35	1,100	17	2.1
89	10	Westfield	22.4	35	617	9	3.8

* Width of outside travel lane and paved shoulder where provided.

Table C-11
Routes 63, 116, and 5 Inventory Results

Inventory #	Route #	Town	Average Width* (feet)	Travel Speed (mph)	Vehicles per Hour	Trucks per Hour	Bicycle Accommodation Rating
90	63	Northfield	22.2	60	139	2	4.3
91	63	Montague	12.8	50	216	3	2.9
92	63	Amherst	19.7	35	343	5	4.4
93	116	Amherst	13.8	35	678	10	2.9
94	116	Springfield	17.0	40	450	7	4.0
95	5	Longmeadow	18.1	40	2,219	33	3.3

* Width of outside travel lane and paved shoulder where provided.

POLICY DIRECTIVE


COMMISSIONER

BICYCLE ROUTE SIGNING STATE HIGHWAYS

The following is MassHighway policy for installing Bicycle Route signing, pavement markings and other appurtenances related to designating portions of state highway as bicycle routes.

MassHighway will only consider signing a state highway as a bicycle route if strict adherence to bicycle related measures have been provided on the facility. This will generally consist of conformance with the following:

- * **Guidance for bicycle routes in accordance with AASHTO and MUTCD (from **Guide for the Development of Bicycle Facilities**, AASHTO, August 1991 or later, and **Manual on Uniform Traffic Control Devices**, FHWA, latest version)**
- * **Roadway design in accordance with FHWA desirable standards (from **Selecting Roadway Design Treatments to Accommodate Bicycles**, FHWA-RD-92-073 **Tables 4, 5, 6, latest revision**). When truck, bus and RV volumes exceed 5%, use the appropriate table values.**
- * **Smooth, paved surfaces for the bicycle path of travel (with “bicycle safe” cascade drainage grates)**
- * **Desirable sight distances (measured from expected bicycle path of travel)**
- * **Consistent treatment (path of travel, signing, safety measures, etc.) throughout the signed corridor**
- * **Connection to a contiguous bikeway system at each end of the signed state highway route**

Distribution: B Please post: _____ Do not post X

- * Designed roadway crossings (crosswalks, signs, signals, etc.), where required, in accordance with MUTCD
- * Potential conflicts with motor vehicles must be minimized

State roadways under consideration for bicycle signing will be reviewed by the State Traffic Engineer in consultation with the MassHighway Bicycle Coordinator for conformance with this policy. Absolute conformance is required; no waiver or exception process is available.

Bicyclists may still use roadways not in conformance with this policy (except where legally prohibited), however, bicycle route signing will not be installed.

Massachusetts Statewide Bicycle Transportation Plan

Roadway Spot Location Inventory

Date: _____

Time: _____

Engineer: _____

Route Number	_____		
Road Name	_____		
Designated Direction	_____ North/South	_____ East/West	
Town/City	_____		
UTM Coordinates	X _____	Closest Mile Marker	_____
	Y _____		
Posted Speed Limit (mph)	_____	Observed Speed (mph)	_____
Terrain	_____ Level	_____ Rolling	_____ Mountainous
Roadway Character	_____ Residential	_____ Industrial	_____ Retail/Sm Bsns
	_____ Institutional	_____ CBD	_____ Recreational

Center Line	_____ Solid	_____ Dashed	_____ None
Edge Line	_____ Thermoplastic	_____ Painted	_____ None
Pavement Type	_____ Bit Asphalt	_____ Concrete	

Side of Road *	Northbound/Eastbound	Southbound/Westbound
# of Lanes	_____	_____
Outside Lane Width **	_____	_____
Inside Lane Width	_____	_____
Bicycle Lane Width	_____	_____
Parking Lane Width	_____	_____
Paved Shoulder Width	_____	_____
Overall Width	_____	_____
Curbing	_____ Mount _____ Barrier _____ None	_____ Mount _____ Barrier _____ None
Sidewalk Width	_____	_____
Side Obstruction ***	_____ Distance _____ Type	_____ Distance _____ Type
Parking	_____ Parallel _____ Angle	_____ Parallel _____ Angle
Median Width	_____	_____

Photo Roll # _____	Photo # _____
Description _____	
Photo Roll # _____	Photo # _____
Description _____	
Photo Roll # _____	Photo # _____
Description _____	
Photo Roll # _____	Photo # _____
Description _____	

General Impressions: Speed/Sight Dist./Trucks/Congestion/Bicycling/Town Center/Etc.

* Circle One - East, West, North, South based on Designated Direction

** Excluding parking lane, if provided

*** Only record side obstructions within 3m of side of road. (i.e.: guard rail, tree, stone walls, etc.)

Mass Bicycle GIS Summary

#	X	Y	SU	AVEWIDTH	ADJSPD	CRBVOL	TRKVOL	ROUTE#	TOWN
1	646186	4730375	4.1	14.6	30	368	6	2	Williamstown
2	656272	4728878	3.3	16.2	40	868	13	2	North Adams
3	666271	4722246	5.0	22.9	30	103	2	2	Savoy
4	677434	4721608	3.4	16.5	55	589	9	2	Shelburne
5	691395	4719036	3.2	21.6	55	667	10	2	Shelburne
6	700316	4724142	3.5	20.5	45	617	9	2	Greenfield
7	706493	4717237	3.7	21.0	60	457	7	2	Erving
8	713359	4719750	3.4	14.3	40	512	8	2	Erving
9	716011	4719524	2.2	12.5	40	815	12	2A	Erving
10	728258	4719206	3.4	20.5	40	847	13	2A	Athol
11	739912	4715894	3.8	15.0	35	468	7	2A	Philipston
12	260139	4714927	3.8	15.0	35	470	7	2A	Westminster
13	271480	4718356	4.4	17.5	30	427	6	2A	Fitchburg
14	282089	4718465	4.1	15.0	45	241	4	2A	Shirley
15	291235	4713864	4.2	16.0	50	241	4	2A/110	Ayer
16	300661	4715142	3.2	15.5	50	554	8	110	Westford
17	309171	4720760	3.3	20.5	40	1159	17	110	Lowell
18	316229	4723552	1.9	12.5	45	1464	22	133	Tewksbury
19	323182	4725991	3.0	16.0	45	863	13	133	Andover
20	329920	4730565	2.5	12.5	45	490	7	133	Boxford
21	344279	4730018	2.4	12.5	40	626	9	133	Rowley
22	659883	4715364	4.3	16.6	50	69	1	116	Savoy
23	672780	4709400	3.5	13.3	50	105	2	116	Plainfield
24	683482	4708370	3.3	12.3	40	121	2	116	Ashfield
25	695098	4706808	2.8	12.5	50	202	3	116	Deerfield
26	725959	4710277	3.1	12.5	55	119	2	122	Petersham
27	734535	4711352	3.2	12.0	40	80	1	101	Philipston
28	742235	4715835	3.6	21.0	50	477	7	101/2A	Gardner
29	258008	4721140	4.0	14.0	45	127	2	101	Ashburnham
30	264466	4730601	3.0	20.5	55	880	13	119	Ashby
31	275724	4728783	2.7	14.5	45	880	13	119	Townsend
32	287829	4726978	3.8	18.0	40	557	8	113	Peperell
33	229410	4728572	2.7	12.5	35	581	9	113	Tyngsborough
34	307421	4723637	2.7	14.0	45	1016	15	113	Lowell
35	316120	4729937	2.3	13.0	45	810	12	113	Methuen
36	322313	4734252	2.5	13.0	40	727	11	113	Methuen
37	331722	4736999	3.5	22.0	40	681	10	113/97	Haverhill
38	339672	4741360	3.5	15.5	45	583	9	113	WNewbury
39	643369	4699850	3.3	19.8	40	1595	24	20	Pittsfield
40	644390	4685060	3.7	17.5	35	744	11	20	Lee
41	655347	4679815	4.3	22.3	55	121	2	20	Becket
42	672025	4679199	4.0	15.3	55	176	3	20	Chester
43	680607	4669191	3.6	22.7	55	514	8	20	Westfield
44	693460	4664192	2.8	13.1	45	444	7	20	West Springfield
45	698512	4664859	3.5	18.0	35	1318	20	20A	Springfield
46	711925	4669748	3.3	18.8	40	989	15	20	Wilbraham
47	726097	4668650	4.2	18.0	60	233	4	20	Brimfield
48	738615	4666727	3.3	19.8	40	948	14	20	Sturbridge
49	255771	4670055	1.5	11.5	55	657	10	20	Charlton
50	269710	4676987	3.0	23.3	50	1592	24	20	Sherborn
51	281911	4688693	3.5	17.8	45	637	10	20	Northboro
52	295386	4691911	3.0	18.8	55	1277	19	20	Sudbury
53	323833	4691261	3.2	16.5	45	1561	23	20	Weston
54	323828	4691265	2.0	12.0	35	1673	25	20	Allston
55	634991	4671982	3.5	20.4	45	607	9	23	Gr Barrington
56	639471	4672206	4.0	20.2	55	331	5	23	Gr Barrington
57	650803	4664594	2.5	10.9	45	44	1	57	Tolland
58	664668	4660639	3.5	12.4	35	44	1	57	Tolland
59	678310	4660431	4.5	16.4	45	48	1	57	Granville
60	691436	4659677	3.2	17.6	45	987	15	57	Feeding Hills
61	699839	4677478	3.2	19.8	45	1695	25	202	Hadley
62	294911	4712763	2.1	13.0	50	824	12	202	Granby
63	716056	4684366	2.3	11.5	55	299	4	9	Belchertown
64	274831	4653352	3.8	19.0	45	464	7	9	Ware
65	740704	4677555	2.5	14.5	50	1067	16	9	Brookfield
66	259814	4681343	3.5	16.5	35	1113	17	9	Leicester
67	266942	4681923	3.7	18.0	30	1083	16	9 (12)	Worcester

Mass Bicycle GIS Summary

68	266949	4681964	3.3	19.0	40	1558	23	122	Worcester
69	281545	4681120	2.2	13.0	45	1051	16	30	Westboro
70	293851	4686143	1.7	12.0	45	1051	16	30	Southboro
71	306860	4688442	2.6	13.3	45	627	9	30	Wayland
72	320857	4689561	3.5	18.0	35	1325	20	30	Newton
73	634991	4671982	2.3	14.1	45	1092	16	7	Gr Barrington
74	640693	4685038	3.1	13.6	50	376	6	7	Stockbridge
75	643369	4699850	3.5	19.8	40	736	11	7	Pittsfield
76	643870	4714635	3.1	22.1	50	849	13	7	Lanesborough
77	646186	4730375	4.1	14.6	30	386	6	7	Williamstown
78	657894	4733639	4.5	15.9	40	171	3	8	Clarksburg
79	655001	4723914	3.3	21.1	40	1031	15	8	Adams
80	648931	4710397	3.2	21.9	55	728	11	8	Cheshire
81	653925	4701336	4.0	14.8	50	94	1	8	Hinsday
82	657219	4686000	3.4	12.8	40	130	2	8	Becket
83	655347	4679815	4.3	22.3	55	121	2	8	Becket
84	659092	4668508	4.3	16.4	45	127	2	8	Otis
85	699904	4725777	2.4	12.0	50	276	4	5/10	Bernardston
86	696808	4711665	3.5	16.1	50	484	7	5/10	Deerfield
87	694839	4695805	2.9	15.3	50	681	10	5/10	Hatfield
88	687576	4678020	2.1	12.5	35	1100	17	10	Southampton
89	684815	4664174	3.8	22.4	35	617	9	10	Westfield
90	708083	4727740	4.3	22.2	60	139	2	63	Northfield
91	703776	4713104	2.9	12.8	50	216	3	63	Montague
92	703154	4698267	4.4	19.7	35	343	5	63	Amherst
93	703732	4686639	2.9	13.8	35	678	10	116	Amherst
94	698113	4673588	4.0	17.0	40	450	7	116	Springfield
95	700394	4660000	3.3	18.1	40	2219	33	5	Longmeadow
96	333957	4735543	3.2	19.0	45	863	13	97	Groveland
97	338465	4726848	2.8	12.5	45	347	5	97	Boxford
98	343545	4709435	2.8	14.0	40	1740	26	107	Salem
99	339515	4704140	3.3	15.0	35	1740	26	107	Lynn
100	335445	4699111	3.0	20.0	60	1249	19	107	Revere
101	345724	4669667	3.3	16.5	40	1825	27	53	Norwell
102	351081	4659832	2.8	13.5	35	845	13	14	Pembroke
103	347833	4649222	3.8	16.8	50	429	6	58	Halifax
104	353910	4637180	3.2	17.0	55	746	11	58	Carver
105	356232	4625408	3.0	17.5	50	990	15	28	Wareham
106	366827	4623522	2.5	14.2	45	2031	30	28	Bourne
107	3658581	4611839	2.7	14.4	40	816	12	151	Falmouth
108	374484	4608317	2.6	14.2	55	816	12	151	Mahpee
109	384495	4612169	1.8	12.5	50	1007	15	28	Barnstable
110	400531	4613259	2.8	14.5	40	1211	18	28	Yarmouth
111	416118	4615248	1.9	10.5	40	490	7	28	Chatham
112	418013	4624851	1.1	10.5	50	758	11	28	Orleans
113	346993	4741085	2.7	14.5	35	698	10	1A	NewburyPort
114	348121	4734995	3.6	17.4	55	472	7	1A	Newbury
115	345929	4730103	3.9	16.5	35	540	8	1A	Rowley
116	345702	4718786	3.3	18.1	40	1249	19	1A	Wenham
117	389130	4578160	3.5	16.0	35	2074	31	1A	Beverly
118	344625	4708732	3.5	17.5	35	1807	27	1A	Salem
119	338632	4701873	1.8	12.0	40	1335	20	1A	Lynn
120	333776	4694696	3.2	18.2	45	1986	30	1A	Revere
121	332749	4682454	2.4	12.5	30	2248	34	3A	Quincy
122	342681	4679234	1.3	11.5	50	892	13	3A	Hingham
123	351648	4675580	2.8	15.5	55	1210	18	3A	Cohasset
124	358740	4660310	1.7	10.5	40	646	10	3A	Marshfield
125	359466	4649167	3.1	15.5	40	944	14	3A	Kingston
126	368454	4643811	2.7	14.2	45	1295	19	3A	Plymouth
127	371369	4631714	3.9	17.0	45	324	5	3A	Plymouth
128	374361	4624883	1.7	12.0	45	892	13	6A	Sandwich
129	389296	4616993	1.9	10.9	40	491	7	6A	Barnstable
130	402160	4622284	2.2	12.0	40	648	10	6A	Dennis
131	417750	4626574	2.7	14.0	40	818	12	6A	Orleans

Mass Bicycle Inventory
As of 9/20/96

New #	UTM	X	Y	ROUTE	TOWN	SPGLIN	ADIST	SPGRATE	ADT	YEAR	TRAFFIC VOLUME DATA				CROSS SECTION DATA										TRUCK DATA		LANES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
											CRASH	GROWTH	PERCENT	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH		CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH	CRASH

New #	UTM	X	Y	ROUTER	TOWN	SPCLM	ADSRD	ISDRATE	TRAFFIC VOLUME DATA				CROSS SECTION DATA										TRUCK DATA			OVERALL RATING	LANES			
									ADT	YEAR	GROWTH	USADT	CRV	WOLV	FSW1	FSW2	OLW1	OLW2	OLW3	OLW4	OLW5	OLW6	OLW7	OLW8	OLW9			OLW10		
1	18	644186	470327	2	Williamstown	25	30	5.0	5900	1991	1.1	6126	348	3.5	EB	12.1	2.0	14.1	4.0	WB	12.1	12.1	12.1	15.1	4.5	14.5	3.5	3	1.1	
2	18	65272	472828	2	North Adams	25	40	3.0	1000	1995	1.1	1467	868	1.0	EB	12.3	3.8	16.0	3.0	WB	12.6	12.6	12.6	16.4	5.0	16.4	3.0	2	1.0	
3	18	64527	472246	2	Stow	35	40	3.0	1700	1993	1.1	1719	103	2.5	EB	12.5	2.0	19.5	3.0	WB	12.5	12.5	12.5	20.0	5.0	20.0	3.0	2	1.0	
4	18	67434	471688	2	Shelburne	30	35	1.0	9300	1993	1.1	9107	589	2.5	EB	12.6	2.7	16.3	5.0	WB	12.6	12.6	12.6	16.7	5.0	16.7	3.0	2	1.0	
5	18	67164	471608	2	Shelburne	30	35	1.0	9300	1995	1.1	11131	687	2.0	EB	12.3	8.9	21.2	5.0	WB	12.3	12.3	12.3	22.0	5.0	22.0	3.0	2	1.0	
6	18	70316	472412	2	Greenfield	40	45	2.0	10000	1995	2.9	10280	617	2.5	EB	20.3	0.0	20.3	5.0	WB	11.8	11.8	11.8	20.8	5.0	20.8	3.0	2	1.0	
7	18	70316	472412	2	Greenfield	40	45	2.0	10000	1994	1.5	7424	627	3.0	EB	12.5	8.0	20.5	5.0	WB	12.5	12.5	12.5	21.5	5.0	21.5	3.0	2	1.0	
8	18	71339	472722	2	Enfield	35	40	3.0	8300	1995	2.8	8532	512	3.0	EB	14.5	0.0	14.5	4.0	WB	14.2	14.2	14.2	20.0	5.0	20.0	3.0	2	1.0	
9	18	71339	472722	2	Enfield	35	40	3.0	8300	1992	1.5	13355	815	1.5	EB	12.0	0.5	12.0	2.5	WB	12.0	12.0	12.0	14.2	4.0	14.2	3.0	2	1.0	
10	18	71339	472722	2	Enfield	35	40	3.0	8300	1992	1.5	14116	847	1.5	EB	20.5	0.0	20.5	5.0	WB	20.5	20.5	20.5	25.0	5.0	25.0	3.0	2	1.0	
11	18	72528	472926	2A	Andover	35	35	4.0	7352	1992	1.5	7803	468	3.0	EB	12.0	3.0	15.0	4.5	WB	12.0	12.0	12.0	15.0	4.5	15.0	3.0	2	1.0	
12	18	73912	473984	2A	Andover	30	35	4.0	5950	1998	1.5	7829	470	3.0	EB	12.0	3.0	15.0	4.5	WB	12.0	12.0	12.0	15.0	4.5	15.0	3.0	2	1.0	
13	19	260139	474927	2A	Westminster	30	35	4.0	5900	1994	1.5	7209	427	3.5	EB	17.5	0.0	17.5	5.0	WB	17.5	17.5	17.5	22.0	5.0	22.0	3.0	2	1.0	
14	19	26089	474845	2A	Andover	40	45	2.0	3900	1994	1.5	4018	241	4.5	EB	13.0	3.0	16.0	5.0	WB	13.0	13.0	13.0	14.0	4.0	14.0	3.0	2	1.0	
15	19	29135	473864	2A/10	Ayer	45	50	1.0	3900	1994	1.5	4018	241	4.5	EB	12.0	4.0	16.0	5.0	WB	12.0	12.0	12.0	16.0	5.0	16.0	3.0	2	1.0	
16	19	30984	473512	10	Westford	45	50	1.0	8450	1988	1.5	9237	139	1.0	EB	12.5	3.0	15.5	4.5	WB	12.5	12.5	12.5	15.5	4.5	15.5	3.0	2	1.0	
17	19	30984	473512	10	Westford	45	50	1.0	8450	1988	1.5	9237	139	1.0	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0	
18	19	31629	473552	133	Tewksbury	40	45	1	20	19629	1990	37	24399	1464	1.0	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0
19	19	32018	473591	133	Andover	40	45	1	20	12000	1991	37	13309	863	1.0	EB	12.5	4.0	16.5	5.0	WB	12.5	12.5	12.5	15.5	4.5	15.5	3.0	2	1.0
20	19	32929	472658	133	Andover	40	45	1	20	7600	1994	37	8173	399	2.0	EB	12.0	0.5	12.0	2.5	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0
21	19	344279	4730015	133	Rowley	35	40	3.0	7800	1988	37	10431	625	2.5	EB	12.5	3.5	16.5	5.0	WB	12.5	12.5	12.5	15.5	4.5	15.5	3.0	2	1.0	
22	18	67983	471354	116	Stow	45	50	1.0	1132	1995	1.1	1144	69	5.0	NB	12.9	3.3	16.3	5.0	WB	12.7	12.7	12.7	15.0	4.0	15.0	3.0	2	1.0	
23	18	67790	479400	116	Plainfield	45	50	1.0	1790	1993	1.1	1797	105	5.0	NB	11.5	2.7	13.7	3.5	WB	11.0	11.0	11.0	13.0	3.0	13.0	2.5	2	1.0	
24	18	68462	479870	116	Andover	35	40	1.0	2100	1995	1.1	2022	121	5.0	NB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	12.5	2.5	12.5	2.5	2	1.0	
25	18	68998	479608	116	Danvers	30	35	1.0	3100	1993	2.8	3468	302	4.5	NB	12.9	0.0	12.9	2.5	WB	12.9	12.9	12.9	15.5	4.5	15.5	3.0	2	1.0	
26	18	72959	470277	122	Plaistown	35	35	1.0	1390	1993	1.5	1367	119	5.0	EB	11.5	1.0	12.5	2.5	WB	11.5	11.5	11.5	12.5	2.5	12.5	2.5	2	1.0	
27	18	74535	471132	101	Phillips	30	30	1.0	1390	1994	1.5	1399	91	5.0	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	12.0	2.0	12.0	2.0	2	1.0	
28	19	74238	471383	101/2A	Gardner	45	45	2.0	2720	1990	1.5	2749	177	3.0	EB	13.0	3.0	16.0	5.0	WB	13.0	13.0	13.0	16.0	5.0	16.0	3.0	2	1.0	
29	19	25008	4721140	11	Asheboro	40	45	2.0	2100	1992	1.5	2123	127	5.0	EB	14.0	0.0	14.0	4.0	WB	14.0	14.0	14.0	17.0	4.0	17.0	3.0	2	1.0	
30	19	24446	472901	119	Asheboro	40	45	2.0	1340	1991	1.5	14682	880	1.0	EB	12.5	3.0	16.0	5.0	WB	12.5	12.5	12.5	16.0	5.0	16.0	3.0	2	1.0	
31	19	23242	472373	119	Dorchester	40	45	2.0	1340	1991	1.5	14682	880	1.0	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0	
32	19	22769	472377	113	Weymouth	30	35	1.0	2310	1994	1.5	2382	137	5.0	EB	12.5	3.0	16.0	5.0	WB	12.5	12.5	12.5	16.0	5.0	16.0	3.0	2	1.0	
33	19	22769	472377	113	Weymouth	30	35	1.0	2310	1994	1.5	2382	137	5.0	EB	12.5	3.0	16.0	5.0	WB	12.5	12.5	12.5	16.0	5.0	16.0	3.0	2	1.0	
34	19	24741	472387	113	Lowell	40	45	2.0	25900	1993	37	24313	1016	1.0	EB	11.0	1.0	12.0	2.0	WB	11.0	11.0	11.0	12.0	2.0	12.0	2.0	2	1.0	
35	19	31120	472387	113	Lowell	40	45	2.0	3340	1988	37	3117	819	2.0	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0	
36	19	31120	472387	113	Lowell	40	45	2.0	3340	1988	37	3117	819	2.0	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0	
37	19	32172	473469	113/97	Weymouth	35	40	3.0	3195	1990	37	3195	641	3.0	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0	
38	19	33972	4741369	113	Weymouth	40	45	2.0	8160	1990	37	92714	593	2.5	EB	12.0	0.0	12.0	2.0	WB	12.0	12.0	12.0	13.0	3.0	13.0	2.5	2	1.0	
39	18	61369	481380	20	Plainfield	35	40	3.0	2000	1994	1.1	24375	1255	1.0	EB	14.9	2.1	22.2	5.0	WB	13.5	13.5	13.5	17.0	5.0	17.0	3.0	2	1.0	
40	18	63519	484504	30	Ware	35	40	3.0	1600	1992	1.1	1620	744	2.0	EB	12.5	0.0	12.5	2.0	WB	12.5	12.5	12.5	15.0	4.0	15.0	3.0	2	1.0	
41	18	63519	484504	30	Ware																									

Appendix D

Funding Sources for Bicycle Facilities

Listed below are some of the funding sources available for bicycle projects. To find out more about each funding source, contact the appropriate agency. Note that these sources are subject to change.

Federal Sources

Intermodal Surface Transportation Efficiency Act

In 1991, Congress passed the Intermodal Surface Transportation Efficiency Act (ISTEA), which expired in 1997. This Act provided potential funding for bicycle improvements through a number of different sources. The following information is from *Bicycle and Pedestrian Provisions* of ISTEA, published by the U.S. Department of Transportation.

National Highway System Fund

National Highway System Funds may be used to construct bicycle transportation facilities on land adjacent to any highway on the National Highway System (other than the Interstate Sys-

tem). These bicycle facilities must be principally for transportation rather than recreation. These bicycle facilities must be located and designed pursuant to an overall plan developed by each metropolitan planning organization (MPO) and state.

Surface Transportation Program Funds

Surface Transportation Program (STP) Funds may be used for either the construction of bicycle transportation facilities or non-construction projects (such as brochures, public service announcements, and route maps) related to safe bicycle use. These bicycle projects must be principally for transportation rather than recreation. These bicycle projects must be located and designed pursuant to an overall plan developed by each MPO and state.

Ten percent of each state's annual STP funds are available only for Transportation Enhancement Activities (TEAs). Of the 10 defined TEAs, two are specifically bicycle- and pedestrian-related: "provision of facilities for bicyclists and pedestrians; and "preservation of abandoned railway

corridors (including the conversion and use thereof for pedestrian or bicycle trails)."

Congestion Mitigation and Air Quality Improvement Program Funds

Congestion Mitigation and Air Quality (CMAQ) Improvement Program Funds may be used for either the construction of bicycle transportation facilities or non-construction projects (such as brochures, public service announcements, and route maps) related to safe bicycle use. These bicycle projects must be principally for transportation rather than recreation. These bicycle and pedestrian projects must be located and designed pursuant to an overall plan developed by each MPO and state.

Federal Lands Highway Funds

Federal Lands Highway Funds may be used to construct bicycle transportation facilities in conjunction with roads, highways, and parkways at the direction of the department charged with the administration of such funds. These bicycle facilities must be principally for transportation rather than recreation. These bicycle and pedestrian projects must be located and designed pursuant to an overall plan developed by each MPO and state.

Scenic Byways Program Funds

Scenic Byways Program Funds may be used to construct facilities for the use of bicyclists.

National Recreational Trails Fund

National Recreational Trails Fund money may be used for a variety of recreational trails pro-

grams to benefit bicyclists. Projects must be consistent with a Statewide Comprehensive Outdoor Recreation Plan required by the Land and Water Conservation Fund Act. (In Massachusetts, this funding is administered by DEM with MassHighway oversight.)

Section 402 Funding

Pedestrian and bicyclist safety remain priority areas for highway safety program funding. Title II, Section 3002 of the ISTEA, addresses the state and community highway safety grant program funds. The priority status of safety programs for pedestrians and bicyclists expedites the approval process for these safety efforts.

A program guideline has been developed to offer states guidance in developing and managing a statewide bicycle and pedestrian safety program.

Federal Transit Funding

Title III, Section 25 of ISTEA continues to allow the use of transit funds for bicycle access to transit facilities, to provide shelters and parking facilities for bicycles in or around transit facilities, or to install racks or other equipment for transporting bicycles on transit vehicles.

National Park Service

Land and Water Conservation Fund

Land and Water Conservation Fund money can be used for the acquisition, development, or renovation of park, recreation, or conservation areas.

Rivers and Trails Conservation Assistance Program

The National Parks Service offers expertise, skills, and resources to eligible communities through the Rivers and Trails Conservation Assistance Program.

Local Sources

Municipalities can also fund bicycle facilities. If a community participates in a bike way project, the community will have a greater sense of ownership. This will help the project's long-term success.

State Sources

Governor's Highway Safety Bureau

Funding from the Governor's Highway Safety Bureau can be used for small-scale physical improvements and for bicycle safety programs.

Department of Environmental Management

The Department of Environmental Management develops and manages bicycle paths most of which serve other DEM facilities.

MassHighway

MassHighway may fund bicycle projects if community and regional support exist, and if there is a demonstrated need for the project. Priority is given to those communities that pay for engineering designs and acquire all necessary permits beforehand. The project must also be listed on the Transportation Improvement Program (TIP) to receive funding.

For additional funding information, see the current Massachusetts Highway Department *State Aid Manual*.

